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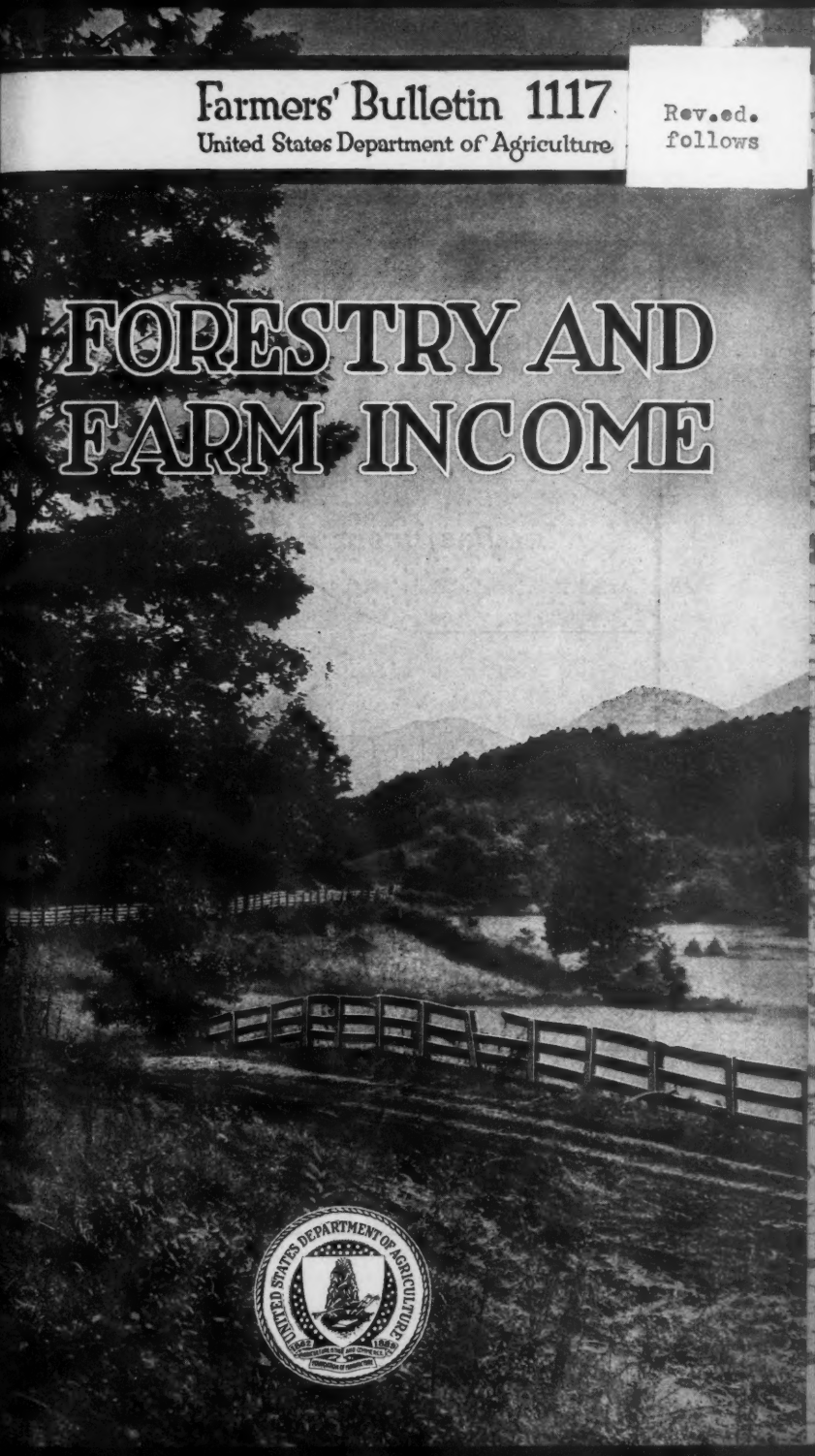
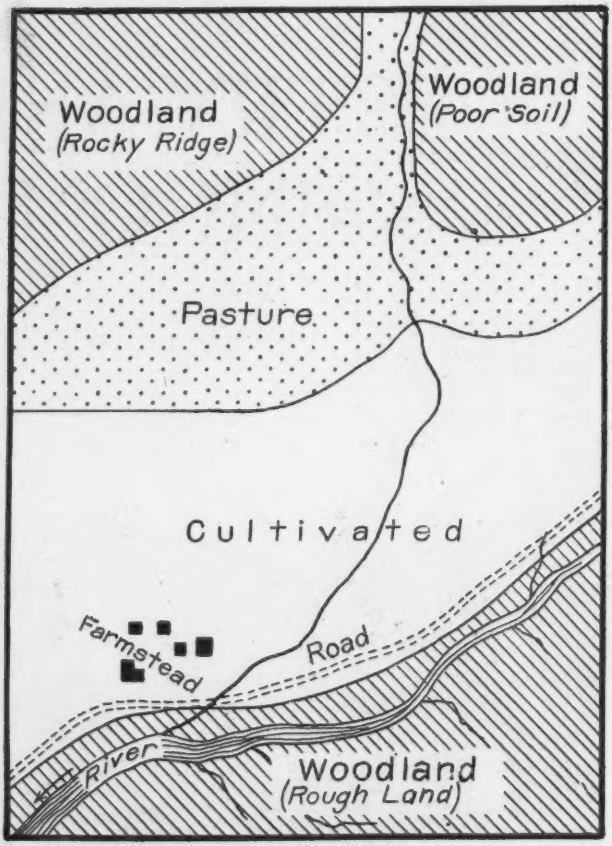
FORESTRY AND FARM INCOME



NO IDLE LAND ON THE FARM.



Woodland on the hills, pasture land on the slopes, and cultivated land below.

Contribution from the Forest Service
WILLIAM B. GREELEY, Forester
Washington, D. C. August, 1920

FORESTRY AND FARM INCOME.

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WHY FARM FORESTRY PAYS.

THE right handling of forest trees on the farm will make it more prosperous, add to its comforts as a home, and enhance its value as an investment.

The home forest, in many sections of the country, will supply the timber which the farm needs for buildings, fences, fuel, repairs of all kinds, and many other uses; and there will often be a surplus which can be sold in the form of standing timber, saw logs, posts, poles, crossties, pulpwood, fuelwood, and blocks or billets for making spokes, handles, spools, boxes, barrels, and excelsior.

A well-cared-for home forest serves also as a windbreak for buildings, a shelter for live stock, a protection of valuable lands from erosion, a means of profitable employment for men and teams during otherwise spare or idle time, a place of recreation, and an improvement in the appearance of the farm.

Trees improve and build up the soil. The leaves, small twigs, and other tree litter decompose and form a layer of dark-colored vegetable mold, which enriches the soil and stores up soil moisture. By means of this layer of mold, the binding of the soil by the roots of the trees, and the resistance of the trunks to the rapid flow of water, the woods prevent floods from gullying or destroying the land by erosion, particularly on steep slopes.

Even if a farmer sells no timber the woodland pays. The firewood, fence posts, and material for repair and construction on the farm, the time and money saved by having them conveniently on hand, and the protection against extremes of weather afforded the crops, farm buildings, and stock are worth considerably more than the slight trouble and expense of raising and caring for the trees.

The woods need not occupy good farm land that will grow other crops. Trees should, as a rule, be located on land too poor to cultivate, such as gullied or very rocky land, swamps, steep slopes, and barren soils. Unused corners and small uncultivated spots about the farm are good places for rapid-growing, useful trees. The chief economic reason for timber growing on the farm is to get a profit from those portions which would otherwise be unproductive.

Though the land on which the farm forest is situated may not be suitable for other crops, it should not be treated as waste land. (Fig. 1.) By a little care it can be made to produce valuable timber. Only a little attention is required, and this may be given in the winter or when other farm work is slack. Forest trees and woodland are

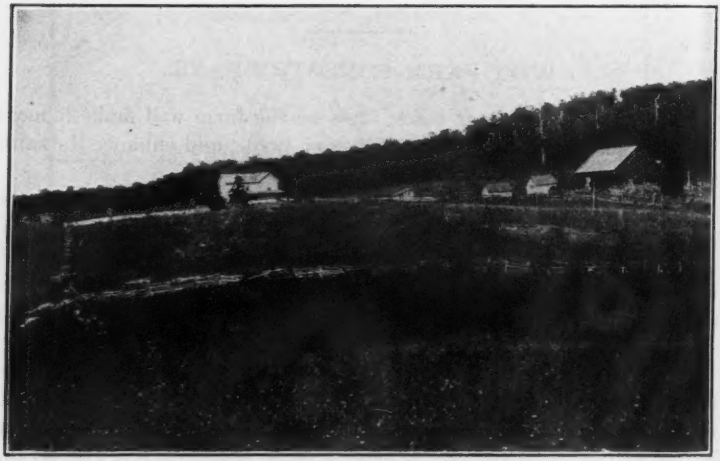

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FIG. 1.—Timber for the farm and for market, and shelter for the farmstead from woodland covering a stony ridge.

more valuable now than they were a few years ago. Many trees that used to have little value, and even small trees that used to be counted as brush to be got rid of, are now in good demand.

A permanent woodland is an essential part of a well-equipped farm; and more than ever before farm woodland has become a valuable asset convertible into money.

EXTENT OF FARM WOODLANDS.

About one-third of all the forest land of the United States is on farms. According to the latest available figures (1910 census) this means that the farm woodlands amounted in all to about 190,000,000 acres. In the eastern United States—east of the Plains—the total woodlands on farms amounted to about 178,000,000 acres. (Fig. 2.)

This is equivalent, roughly, to the aggregate area of the States of Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Kentucky, and Tennessee. If placed continguous it would form a solid strip 105 miles in width reaching from New York to San Francisco. Farm woodlands in the eastern United States comprise an area nearly eight times as large as the entire forest lands of France, which furnished

FIG. 2.—Important farm woodland regions.

practically all the timber required during the war by the armies of France, Great Britain, Belgium, and the United States.

Assuming that every farm in the eastern United States has some woodland, there is an average of about 32 acres per farm. The amount of woodland on farms varies somewhat, however, in the different sections of the country. That portion of the United States

under consideration is shown with its subdivisions in figure 2. The average area of woodland per farm and the average proportion of the farm that is wooded in the eastern half of the United States[1] are shown in the following table:

Group of States.	Average area of woodland per farm.	Proportion of farm land wooded.	Total area of farm woodland.
	Acres.	*Per cent.*	*Acres.*
New England (6)	41.6	39.8	7,852,913
Middle Atlantic (3)	19.8	21.6	9,255,580
South Atlantic (8)	43.8	46.9	21,037,133
Lake (3)	22.6	18.1	12,227,525
North Central (5)	17.0	14.4	47,902,665
South Central (8)	38.4	30.5	76,343,075
Average per farm	31.6	27.7	174,618,891

VALUE OF WOODLAND PRODUCTS.

Considerable income may be derived from the home forest. The total value of forest products taken from timbered land on farms east of the Great Plains, reported in the 1910 census, was $195,306,000.[2] More than half of this represents the value of wood and various minor wood products used on the farm and the rest the

TIMBER RAISING IN EASTERN UNITED STATES PAYS BECAUSE—

1. There is plenty of cheap land unfit for agriculture.
2. The abundant rainfall permits rapid tree growth.
3. Transportation facilities by rail and water are good.
4. Numerous large cities furnish an adequate market.
5. The region is far removed from the virgin supplies of the Pacific Northwest.

[1] Includes 33 eastern States, as far west as and including the tier of States from Minnesota south to Louisiana, and Oklahoma and Texas.

[2] On account of big increases in value and probably some increase in production, the total value of the material cut from farm woodlands in 1919 is estimated at about double, or about $400,000,000.

value of the products sold or cut and held for sale. For the farms reporting this amounts to an average of about $85 per farm. Thirty-five States reported over $1,000,000 each in forest products from their farms; and three—North Carolina, New York, and Virginia—reported more than $10,000,000 each.[1]

Firewood is one of the important crops of the farm. In 1918 an average of 11.5 cords of wood, or a total of 77,092,000 cords, were burned on the farms of the country. The total production of cordwood during the year, which includes wood burned on farms and that sold by farmers to city dwellers, amounted to approximately 102,903,000 cords. The average farm value in 1918 was $4.73 a cord. The figures show that farmers in the southern States are the heaviest fuel-wood users. North Carolina leads with an average of 18 cords used on each farm during the year. The farms of South Carolina and Arkansas averaged 17 cords; of Mississippi, 16 cords; of Georgia, Tennessee, Louisiana, Kentucky, Nevada, and Vermont, 15 cords. The value of the fuel-wood crop cut from farms in 1918 was exceeded by that of only five crops—corns, wheat, oats, rye, and cotton.

SECURING GOOD FOREST GROWTH.

At present farm woodlands are yielding, as a rule, only from one-third to one-half the wood they could grow. This is because only a few farmers realize the possibilities in their woodlands and give them proper care. As a result the home forest, which is close at

$1 A DAY PROFIT.

A NEW YORK FARMER'S WOODLAND OF 115 ACRES EARNS HIM A CONTINUOUS PROFIT OF $1 A DAY.

The annual growth is 0.65 cord per acre.
115×0.65=75 cords (mostly poplar).
He cuts an annual crop of 75 cords.
His profit is $4.86 per cord.
75×$4.86=$364.50.

[1] More than three-quarters of the present total timber supply of the United States is on privately owned lands. Much has been said about the National Forests, but the fact is that they contain somewhat less than one-quarter of the country's timber, and the timber now being cut from them represents only about 3 per cent of the entire consumption. The rest comes from private lands.

hand, where a little attention each year in protecting, cutting, and utilizing the timber would be very profitable, is in poor condition.

The amount of timber that an acre can grow in a year varies a good deal with the quality of the soil and moisture supply and the kind and number of the trees per acre. If fully stocked with trees and well cared for, an acre of hardwoods should grow yearly from about one-half to 1 cord of wood and of pine from 1 to 2 cords, a cord being equivalent to about 500 board feet of saw timber. Growth averages rather less in the northern part of the country because of the shorter season and somewhat more in the warmer southern part.

The chief essentials in keeping the trees growing are excluding fires and allowing the humus to collect on the forest floor. Large openings in the woods reduce the annual yield of timber and should not be allowed to occur. The length of time required to reach merchantable size varies with the kind of tree and the use to which its wood is to be put. Posts and crossties may be grown in from 10 to 30 years, and most kinds of quick-growing trees will be large enough for saw timber in from 20 to 40 years.

After logging, a new stand of young trees generally starts naturally from seeds or sprouts from stumps. The natural seeding process in the woods can be helped by harrowing the ground or, before the seed falls, turning hogs into the woodland, both of which enable the seed to get in contact with the mineral soil, or by conducting logging operations in a good seed year before the seed falls, so that it germinates quickly.

A WHITE PINE STAND IN NEW HAMPSHIRE GROWS 1,000 BOARD FEET A YEAR.

Two acres of white pine, near Keene, N. H., were sold three or four years ago, before the war prices, for $2,000 on the stump. The total stand was 254 cords, which equals 170,000 board feet, or an average of 85,000 feet per acre. The trees were from 80 to 85 years old; so the growth on each acre was about 1,000 feet per annum and the gross returns about $12.20 per acre per annum.

Some points to be remembered about trees which sprout are: (1) The most thrifty sprouts come from clean, well-cut stumps felled during the late fall, winter, or very early spring before the sap begins to flow; and (2) the top of the stump should be cut slanting, so as to shed water. Trees which sprout successfully include such

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FIG. 3.—Thrifty woods, good crops, and a happy farmer.

hardwoods as the oaks, hickories, chestnut, basswood, gums, cottonwood, and willows, and young short-leaf and pitch pines.

Woodlands may also be restocked with young trees by sowing seed or planting out small seedlings grown in nursery beds or dug up in the woods. If trees are to be planted, it is well to select those native to the region which grow most rapidly and produce the most useful kinds of wood.

TREES TO CUT FOR IMPROVING THE WOODS.

Trees which are well suited for firewood, and the removal of which will be an improvement to the remaining trees in the stand.

Trees which have been overtopped by others and have had their growth stunted.

Diseased trees, or trees seriously injured by insect attacks, or trees extremely liable to such injury; for example, chestnut in the region subject to blight or birch in the gipsy-moth area.

Badly fire-scarred trees.

Trees of the less valuable species, such as beech, birch, black oak, black jack oak, or black gum, crowding the more valuable sugar maple, white or shortleaf pines, yellow poplar, or white oak.

Crooked trees and large-crowned, short-boled trees which will not make good lumber and which are crowding or overtopping others.

Slow-growing trees crowding fast-growing species of equal value.

Sound dead trees, both standing and down.

IMPROVING THE WOODS BY CUTTING.

Cutting should be done so as to cause the least possible waste or damage to other living trees, particularly young trees. In felling trees, advantage should be taken of natural openings in the woods.

Good management should result in a home forest fully stocked with sound, well-shaped trees of valuable and useful kinds that are growing as fast as possible. This can be brought about largely by cutting out the inferior kinds—the "weed" trees—for exactly the same reason that weeds are hoed out of the cornfield. The good trees need the light, space, soil moisture, and plant food that would

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FIG. 4.—Woods improved by right cutting.

otherwise be taken by the less valuable trees. Sometimes it becomes advisable to fill openings or improve the quality of the woods by planting seeds or seedlings of desirable kinds of trees.

What sort of trees should be removed? Dead and dying trees; diseased trees; deformed trees which shade out better ones; the less valuable kinds, such as gray birch, aspen, blackjack oak, dogwood, sourwood, blue beech, ironwood, and others; and the less promising trees in crowded groups. By following this practice each year improvement in the forest is brought about in a relatively short time.

The wood removed in improvement cuttings need not be a loss. It should be considered as an early crop that can be used or sold, generally at a price to show a profit on the work of thinning, while the woods are made more valuable by its removal.[1]

[1] See Farmers' Bulletin 711, "The Care and Improvement of Farm Woods."

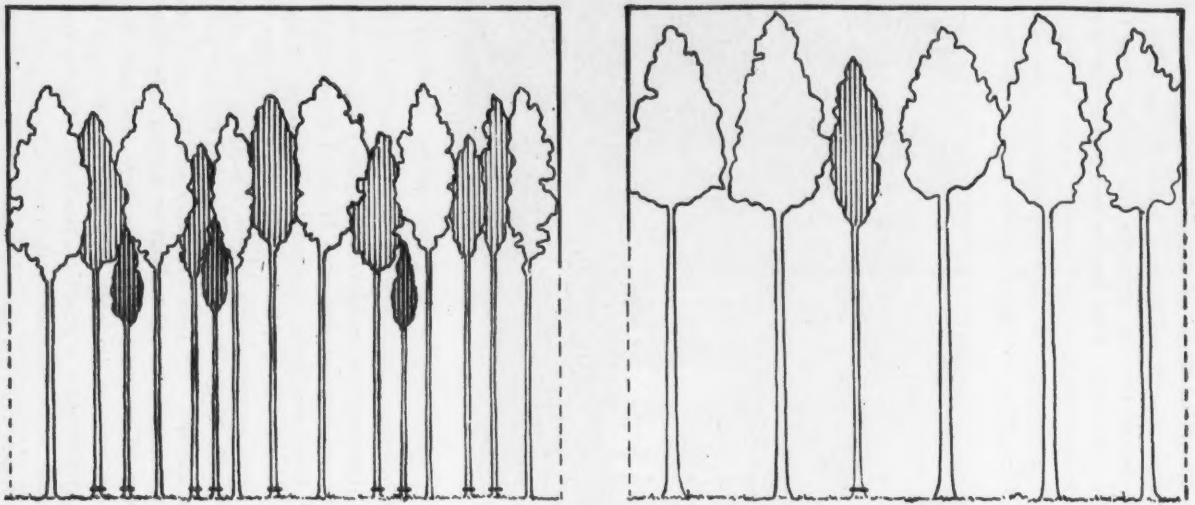

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FIG. 6.—The growth and value of pine are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber. (A) Before thinning—15 overcrowded trees. (Shaded trees to be cut.) (B) The same stand 5 years later after thinning—6 larger and more valuable trees. (Shaded tree to be cut).

ESTIMATING AND SELLING TIMBER.

When timber is no longer growing at a profitable rate it should be cut and used or sold. A farmer who is ready to sell timber would profit by measuring his trees, estimating how much saw timber or

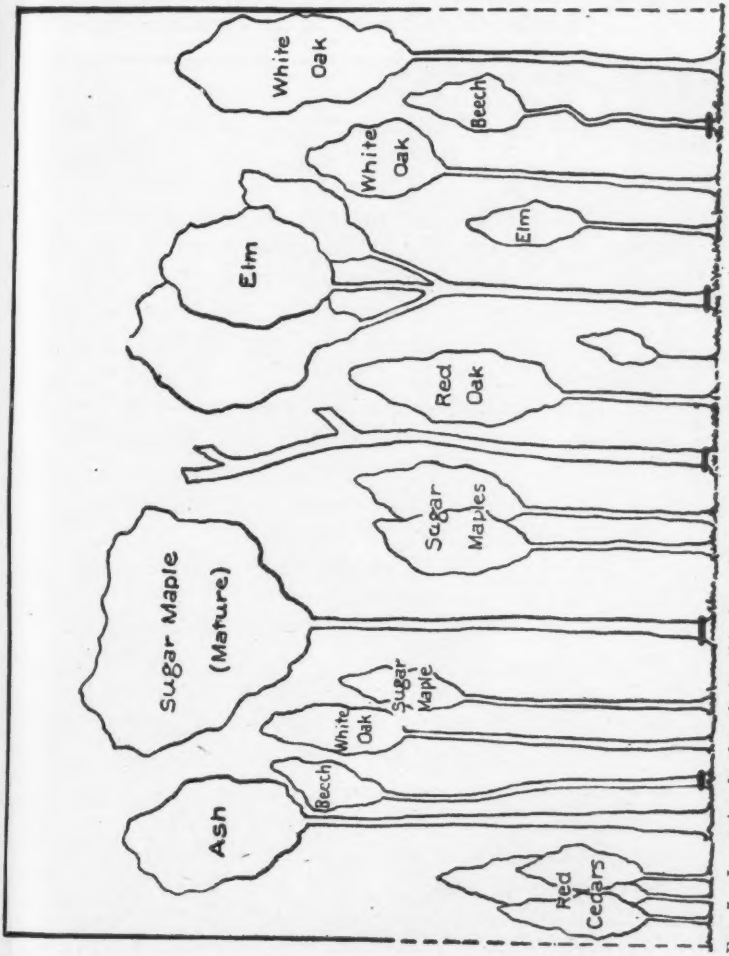

FIG. 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species to be cut. A good stand left of thrifty middle-aged and promising young trees.

other products they contain, and making inquiry to find out how much they are worth. If he does not know or can not find out how to do this, he should employ some experienced and reliable person to estimate and value his timber for him.

The customary units of measure in selling farm timber are board feet, cords, linear feet, and the piece. A board foot, for example, is 12 inches long, 12 inches wide, and 1 inch thick, or its equivalent.

TEN HELPS IN MARKETING WOODLAND PRODUCTS.

1. Get prices for various wood products from as many saw mills and other wood-using plants as possible.
2. Before selling, consult neighbors who have sold timber and benefit from their experiences.
3. Investigate local timber requirements and prices. Your products may be worth more locally because transportation is saved.
4. Advertise in papers and otherwise secure outside competition.
5. Secure bids if practicable both by the lump and by log-scale measure.
6. Be sure that you are selling to responsible purchasers.
7. Get a reliable estimate of the amount and value of the material before selling.
8. Market the higher grades of timber and use the cheaper for farm purposes.
9. Remember that standing timber can wait over a period of low prices without rapid deterioration.
10. Use a written agreement in selling timber, especially if cutting is done by purchaser.

The standard cord of wood is 4 feet high, 4 feet wide, and 8 feet long. The linear foot is a measure of length only, without regard to the other dimensions of the material. Piece measure is only a count of the pieces in any form in which the wood is sold.

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FIG. 7.—Fast-growing hickory is one of the most marketable forest trees. It is in strong demand for spokes and implement handles.

Logs and standing trees are usually estimated in board feet. Saw timber is measured in board feet. Round timber, such as poles and piling, is usually sold by the linear foot. Firewood, pulpwood, and wood for distillation and other uses cut in short lengths are usually sold by the cord. Fence posts, ties, telephone poles, and some other forms of timber are sold by the piece.

FARM WOODLAND IN THE NORTH.

Farm woodlands amount to two-fifths of all forested lands.

There are about 53,000,000 acres of farm woodland.

In New England more than 65 per cent of all forested land is on farms, and in Ohio, Indiana, Illinois, and Iowa from 80 to 100 per cent.

The income to farms from timber products is estimated at about $162,000,000 yearly.

Saw timber in the standing tree is estimated by measuring the diameter of the tree, outside the bark, at breast height ($4\frac{1}{2}$ feet above the ground), and measuring or estimating the height of the tree. When these measurements are known the contents of the tree can be found from a volume table.[1] Often the length of the part of the trunk to be used is taken in units, or number of 16-foot logs, instead of the total height of the tree.

A volume table is one showing in board feet the amount of timber that can be sawed from trees of given heights and diameters or from a given number of merchantable logs and diameters. For example, a volume table for white oak would show that a tree 18 inches in diameter (measured outside the bark at breast height) and having three merchantable 16-foot logs will saw out 286 board feet of lumber Volume tables are made for different kinds of trees, each table based on the average of many measures of felled trees.

A saw log is measured by taking the length of the log and its diameter inside the bark at the small end, then employing a log rule to estimate the amount or number of board feet it contains. A log rule is a statement of the estimated number of board feet of lumber that can be sawed from logs of different lengths and sizes. A good rule for 12-foot logs is to multiply the diameter inside bark at the small end by half the diameter. For shorter logs the contents will be proportional to the length of the logs. Thus, a 12-foot log 16 inches in diameter will saw out about 16×8 or 128 board feet, while a 10-foot log 14 inches in diameter will cut $\frac{10}{12}$ of 14×7, or $81\frac{2}{3}$

[1] For volume tables and other information on estimating and measuring timber, see Farmers' Bulletin 715 or apply to State foresters.

FARM WOODLAND IN THE SOUTH.

Woodlands on farms comprise one-half of all the forested lands.

There are more than 125,000,000 acres of farm woodland.

In Maryland, Virginia, North Carolina, Kentucky, and Oklahoma, more than 60 per cent of all forest land is on farms.

The present yearly farm income from woodlands is estimated at about $150,000,000.

board feet. The Doyle rule is probably most commonly used in this country. To determine the number of board feet in a log by this rule deduct 4 inches from the diameter of the small end, then square one-fourth the remainder and multiply the product by the length in feet. For example, a log measuring 20 inches at the small end and 12 feet long contains 192 feet. This is not an accurate rule for small-sized timber, since it shows one-half to one-fourth fewer board feet in logs from 6 to 20 inches in diameter than are actually sawed out in the mill. For logs larger than 20 inches it is fairly accurate. In buying and selling operations the value placed on small logs is sometimes made to take into account the small scale on the basis of the Doyle rule, but more often the seller is the loser.

FARM FORESTRY MAKES FARMING PAY BETTER BY—

1. Marketing timber profitably.
2. Supplying timber for farm needs.
3. Furnishing employment for men and teams in winter.
4. Making waste lands yield a profit.
5. Increasing the sale value of the farm.

160030°—20——3

For handy reference the Champlain and Doyle log scales are given (Tables 1 and 2) for logs measuring from 6 to 25 inches in diameter. The former scale shows approximately the amount of lumber that can be sawed out in small mills using circular saws, cutting ¼-inch saw kerf but operated carefully without unnecessary waste and otherwise closely utilizing the timber.

TABLE 1.—*Champlain Log Scale.*[1]

Diameter of log (between bark at small end).	Length of log, in feet.								
	8	9	10	11	12	13	14	15	16
	Contents of log, in board feet.								
Inches.									
6	11	12	14	15	17	18	19	21	22
7	16	18	20	22	24	26	28	30	32
8	21	24	27	30	32	35	38	40	43
9	28	31	35	38	42	45	49	52	56
10	35	40	44	48	53	57	62	66	70
11	43	49	54	60	65	70	76	81	87
12	52	59	65	72	78	85	92	98	105
13	62	70	78	85	93	101	109	116	124
14	73	82	91	100	109	118	127	136	146
15	84	95	105	116	126	137	147	158	168
16	97	109	121	133	145	157	169	181	193
17	110	123	137	151	165	178	192	206	219
18	124	139	155	170	186	201	217	232	247
19	139	156	173	190	208	225	242	260	277
20	154	173	193	212	231	251	270	289	308
21	171	192	213	235	256	277	299	320	341
22	188	212	235	259	282	306	329	353	376
23	206	232	258	284	309	335	361	387	412
24	225	253	282	310	338	366	394	422	450
25	245	276	306	337	368	398	429	460	490

TABLE 2.—*Doyle Log Scale.*[2]

Diameter of log (between bark at small end).	Length of log, in feet.					
	6	8	10	12	14	16
	Contents of log, in board feet.					
Inches.						
6	1.5	2	2.5	3	3.5	4
7	3.4	4.5	5.6	6.8	7.9	9
8	6	8	10	12	14	16
9	9	12	16	19	22	25
10	13	18	22	27	31	36
11	18	24	31	37	43	49
12	24	32	40	48	56	64
13	30	40	51	61	71	81
14	37	50	62	75	87	100
15	45	60	76	91	106	121
16	54	72	90	108	126	144
17	63	84	106	127	148	169
18	73	98	122	147	171	196
19	84	112	141	169	197	225
20	96	128	160	192	224	256
21	108	144	181	217	253	289
22	121	162	202	243	283	324
23	135	180	226	271	316	361
24	150	200	250	300	350	400
25	165	220	276	331	386	441

[1] The Champlain rule shows approximately the amount of lumber cut from logs by close sawing. The full table includes logs up to 60 inches in diameter.

[2] The Doyle rule was originated at the time of abundant and cheap timber. It gives a much smaller scale for small-sized logs than is actually sawed out according to present custom. The full table runs to and includes logs 40 inches in diameter.

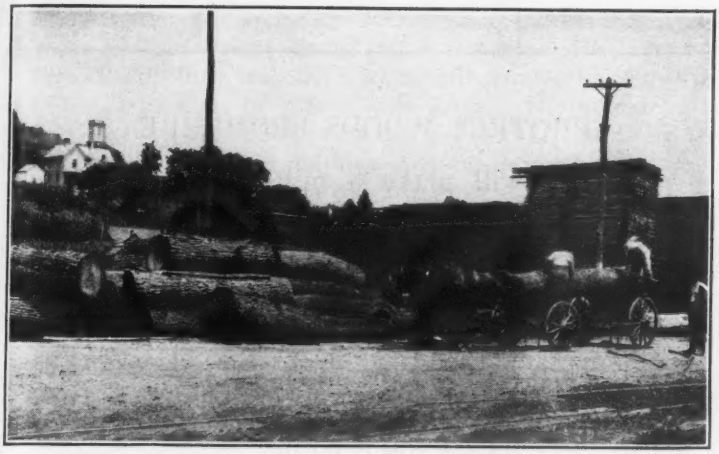

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FIG. 8.—Choice logs bring high prices and are often shipped long distances.

In finding a buyer for his timber the owner should inquire of his neighbors who have sold, or at local sawmills, wood yards, wood-using factories, railroad stations, and telegraph and telephone companies. He should also advertise in the papers and write personal letters furnishing a brief description of the kind, quality, and amount of timber for sale, in order to awaken competition among local and outside buyers. Securing a number of bids for the same piece of timber will tend to develop the best market and increase returns. It is well to have a written agreement as to the manner in which the timber shall be cut, the amount and form of payment.[1]

Some of the industries buy their supplies largely or wholly in the log; hence, in many cases it will pay the farmer to look up these special markets for his logs, bolts, poles, ties, etc. Industries buying their supplies more or less generally in the form of round timber are manufacturers of handles, cooperage, veneer, woodenware and novelties, shuttles, bobbins and spools, vehicle stock, athletic goods, and pulpwood. Poles are purchased by electric lighting, power, and telephone companies. Markets for piling will be found by applying to railroads, wharf, bridge, and bulkhead contractors in the larger towns and cities. For prices on ties, consult the nearest local railroad station agent. Cordwood is used by brickmakers, bakeries, limekiln operators, and fuel dealers in towns.

[1] A sample contract and a good many helpful points on measuring and selling farm forest products may be found in Farmers' Bulletin 715, "Measuring and Marketing Farm Timber," and Farmers' Bulletin 1100, "Cooperative Marketing of Woodland Products."

PROTECT WOODS FROM FIRE.

A tree will make a million matches—a match may destroy a million trees.

Take no chances with lighted matches, tobacco, brush or camp fires.

Forest destruction is quick—forest growth slow.

Burned timber pays no wages.

When fire is discovered, put it out if you can. Get help if you need it.

ARE YOU PRACTICING PREVENTION AND FOREST PROTECTION?

HELP PREVENT WOODS FIRES.

BE SURE your match is out before throwing it away.

DON'T throw away burning tobacco.

CHOOSE a safe place and make your camp fire small.

PUT OUT your fire with water and then cover it with earth.

DON'T make large brush heaps. Choose a still day for burning, and plow furrows to protect near-by woods.

BE CAREFUL WITH FIRE.

FIRE PROTECTION.

The forest must be protected. Fire, grazing, careless logging, tree diseases, and insect pests are the principal sources of injury.

Fire kills the little trees and weakens full-grown trees so that they may become diseased or infested with insects. It also destroys the humus cover of leaves and twigs that ordinarily protects the trees against summer drought and heat, conserves water for the springs and streams, and enriches the soil by adding nitrogen. The loss of this natural fertilizer by burning amounts to a very large sum, entirely sufficient to warrant complete fire protection of the country's forests.

Burning over the ground with the aim of improving grazing is an expensive mistake. Although it is possible to secure green grass for stock a week or two earlier in the spring, most of the rich leguminous plants and annual grasses are exterminated, leaving as survivors only the hardy bunch, wiry, and other coarse perennial grasses.

Dead trees and tops cut in logging are a fire menace and should, if possible, be utilized. Sawlogs or firewood can be made out of the dead trees and the unused large tops should be lopped so that they will lie close to the ground and rot quickly.

Some idea of the prevalence of fires in the eastern United States, including the Mississippi Basin, may be formed from the fact that here occur 80 out of every 100 forest fires. For the three years of 1916, 1917, and 1918 the 27,500 fires in this region burned over 13,000,000 acres of forest land and caused a property loss amounting to more than $19,000,000. While fires were reported from all States, a greater number of fires and larger losses occurred in the southern pine district than in any other important forest region.

Are there any laws about forest fires? Yes. Practically every State has strict laws against the setting of fire and carelessness in the burning of brush. In a number of States the railroads are required to use efficient spark arresters in their locomotives and burn fire lines along their rights of way.

Forest fire protective systems have been established by a number of States. Patrolmen are employed who travel the regions where there is danger of forest fires, watch for fire, and educate the public in the need for care in preventing fire and for getting quickly to any fire that may occur. Owners of woodland should get in touch with the State foresters and fire patrolmen and secure their cooperation and assistance in keeping down fire damage.

GRAZING AND INSECT DAMAGE.

Horses and cattle eat and break down young trees and pack the ground hard. Sheep and goats destroy large numbers of small

trees by eating them. Hogs root up the ground, digging up the young trees and roots and sometimes eating the roots. They also prevent young trees from starting by devouring the nuts and other seeds from which they grow. On the other hand, however, trees bearing small or unpalatable seeds often start well after hogs have rooted up the leaf litter and soil.

Some people fear that good pasture will be wasted by keeping stock out of the woods. This is hardly true, since a fully stocked woodland has little or no grass in it, for the reason that there is insufficient light. (Fig. 9.) Studies in farm management in northwestern Pennsylvania show that an open stand of trees, such as occur

F-39252A

FIG. 9.—Pine grows rapidly and every five years yields a crop by thinning.

in average wooded pastures, reduces the pasturage value of the land as much as 65 to 70 per cent.[1] Grass in the woods is a sign that the stand is in poor condition and the trees too far apart for growing a good quality and large amount of timber. This hardly applies in the southern longleaf pine region, where much good timber occurs in open stands. Grass grown under the shade of trees is much less nutritious than that grown in the open, so its actual food value is small.

Plenty of shade for live stock should be provided in pastures, but pasture land and woodland are most profitable when managed separately, each for the growing of its own individual product.

[1] Agriculture Bulletin 853, "The Organization and Management of Farms in Northwestern Pennsylvania."

Woodland may be guarded against serious insect damage and disease by removing dead or dying trees and all those showing signs of insect attack or decay. In the South, pine should be cut in the cool part of the year. When it is cut in summer, barkbeetles and wood-borers injure the cut trees, multiply rapidly, and spread to living trees, which they often kill by eating the rich inner bark for food. In cases of insect menace or injury it would be best to get into communication with the Bureau of Entomology, U. S. Department of Agriculture, or the State entomologist.

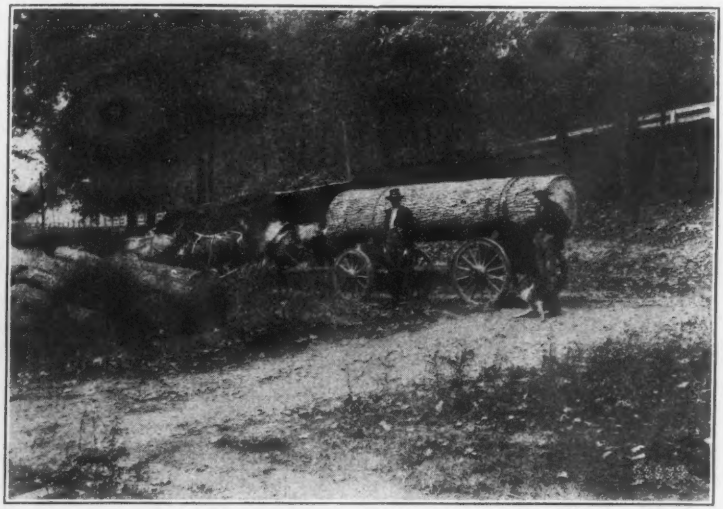

FIG. 10.—Because they split easily, clear white oak butt logs have been worked up into fence posts when several farmers could have jointly shipped a carload at fancy prices.

USING TIMBER AT HOME.

Lack of knowledge of the proper use of timber is one form of farm mismanagement.

It is a mistake to saw up choice logs of white oak, ash, cherry, and yellow poplar for rough uses at home, or to use clear black walnut for gate boards, or split up white-oak butts for fence posts. (Fig. 10.) Many valuable logs go into crossties, when they would bring the owner much more if sold as saw logs. Large numbers of young, rapid-growing trees, producing only one small tie, are cut, which, if left to grow for from three to five years, would more than double the profit.

Cutting is commonly done promiscuously without regard to continuing the future productiveness of the woodland, and large amounts of timber are commonly wasted in high stumps and long tops.

The importance of the home forest as a reserve for "pinch" times can not be overestimated. In the midst of the lumber shortage and high prices during the fall of 1919 and the spring of 1920, for example, communities and individual farms having local supplies of standing timber are reported to have suffered the least from the widespread deterioration of farm buildings and deferment of necessary new construction. The effect has been not only smaller losses of crops and live stock but better farm conditions and more contended farm labor.

Timber that is cut in the late spring and summer months should be handled with special care to avoid injury. This is because freshly cut wood is then more likely to be attacked by insects and fungi than during the cold part of the year. Seasoning also proceeds more rapidly during the warmer season and may cause excessive checking. If rightly handled, posts, poles, and logs may be cut at any season without their durability being affected. In no case should wood be allowed to lie in direct contact with the ground. The opportunity for insect attack and decay can be reduced to a minimum by peeling the timbers and open piling them off the ground in a shaded but dry place. This, however, does not retard checking of the wood.

Logs are sometimes stored under water in the hot season to prevent blue stain, checking, insect attack, and decay. Painting the ends of logs with a yellow ochre or barn paint will very materially retard injury by end checking. Painting peeled timbers with creosote will prevent sap stain and decay.

TREATING FENCE POSTS.

Every farm needs fence posts, but relatively few have sufficient supplies of lasting wood to meet home needs. This is particularly true in the Middle West and South. By means of a simple method of treating timber in open tanks with cold-tar creosote, the post and pole problem can be readily solved. By this process such short-lived woods as soft maple, beech, birch, sweet gum, black gum, young or sap pine, and red oak are made durable for use in the ground for 10 to 20 years, or even longer.

A comparison of the annual costs of maintaining three fences built with posts of untreated sap pine, untreated white or post oak, treated white or post oak, and treated sap pine, respectively, indicates a saving of $6 to $24 per mile in favor of the treated pine. The following estimate is believed to be representative of the costs over a considerable part of the region where white oak or post oak and yellow pine occur:

Relative economy of treated and untreated fence posts.[1]

	Untreated sap pine.	Untreated white or post oak.	Creosoted sap pine.
Cost of post	$0.05	$0.12	$0.07
Cost of treatment			.18
Cost of setting	.15	.15	.15
Total cost of post in ground	.20	.27	.40
Average life of post in years	2	6	15
Average yearly cost	$0.10	$0.04½	$0.02½
Average yearly cost of 1 mile of fence (posts 1 rod apart)	$32.00	$14.40	$8.00

[1] The costs of materials and labor, which were representive in 1919, should be regarded as showing relative rather than absolute values.

Although more expensive at the outset, creosoted posts are generally more economical to use than many kinds of untreated, short-lived woods, because of their much greater lasting qualities. The exceptions would be in remote localities with cheap wood and labor and where it would be expensive to obtain creosote. The large saving in the replacement charges, which ordinarily mount up so high in maintaining a fence, and the use of cheap and inferior kinds of wood in the first place, much more than offset the increased cost of thorough treatment with creosote. (Fig. 11.) Treated posts are a good investment and their use where lasting woods are scarce or expensive is a sign of sound judgment in farm management.

Cutting and seasoning.—It is important that the timber be peeled and thoroughly seasoned before an attempt is made to treat it. Small flakes of inner bark left on the wood prevent proper absorption of the preservative at those places. Peeling is done most easily during the spring months, but is carried on at other seasons of the year. The posts to be treated should be peeled from 3 to 4 months, depending upon the weather, before treatment, and open-piled in a dry situation to effect proper seasoning.

Kinds of posts.—Because they have a uniform absorbing surface of sap wood, round sticks are more satisfactory than split timber for treatment.

It is not profitable to treat lasting woods, such as red cedar, black locust, chestnut, and white oak. Practically all of the soft woods or sap woods may be treated and profitably used as posts.

Small-sized timber.—When treated timber is used it is not necessary to cut the large-sized line posts commonly employed untreated in the past. A post from 2 to 3 inches in top diameter, long enough to allow only a few inches above the top wire, costs less for creosoting and labor in handling, lasts as long as larger-sized timber, and possesses ample strength for ordinary fences. Small-sized trees are

abundant in second-growth timber, often being crowded out by more vigorous neighboring trees. Cutting these for fence posts utilizes

FIG. 11.—The treating of nondurable timber brings many kinds of wood into new forms of utilization. (Photo by courtesy of Iowa State College of Agriculture.)

the forest product that would often otherwise be wasted, improves the remaining stand, and furnishes profitable employment on the farm during slack time.

Kind of treatment.—Application of creosote by brushing over the whole post is only slightly effective in preventing decay, and rot often starts in small cracks which are not reached by the brush, or in checks which soon develop while the post is in use.

Open-tank treatment with a hot bath, followed by a cold bath is recommended for fence posts. The sapwood surrounding the heart-

wood takes treatment readily and is thereby protected against the entrance of decay.

Preservative.—It is important to use a good preservative, and coal-tar creosote has been found to be by far the most satisfactory material. Ordinary gas tar or coal tar has been used more or less, but it is usually too thick even when treated to give a fair degree of penetration.

Treating.—The best treatment is that which results in the deepest penetration into the wood with the least absorption of creosote. The butts of the posts should be placed for one to two hours in creosote heated to a temperature of 180° to 220° F. It is important to treat the wood to a height of a foot above the proposed ground line. In the southern States, the entire post should then be submerged into cold oil, 80° to 100° F., for one to two hours, or for such time as is necessary to get a good penetration. In the North where decay is less rapid, the cold treatment is applied usually to the butts only, the tops being treated by painting or dipping in creosote.

A satisfactory outfit for treating posts successfully consists of an upright cylindrical tank for the hot treatment, and a horizontal rectangular tank for the cold bath.

A saving in cost can be made by two or more farmers joining together in the purchase and use of treating tanks. This method in a number of instances has proved to be a successful form of cooperation.

PLANTING FOREST TREES.

The profitableness of forest planting can not be laid down by any rule, since it is subject to very wide variation. Rapid-growing kinds of trees of good, standard value can be grown profitably, however, on cheap lands located relatively near good markets. For example, as shown by actual demonstration on page 29, white pine yields very good returns in New England, and the same may be said of the yellow pines in various parts of the South. By good authorities it is held that white pine is the most profitable crop possible on large areas of New England. In the Northeastern States, Wisconsin, and Minnesota, the white pine blister rust is present, and planters of white pine should protect it from this disease by destroying all wild and cultivated currants and gooseberries within three hundred yards of the plantation. These bushes are the alternate hosts of the blister rust and if permitted to remain near native or planted white pines in regions where the blister rust is prevalent, the trees become diseased and gradually die. Usually the cost of uprooting wild currant and gooseberry bushes is small.[1]

In rich agricultural belts the planting of forest trees on a large scale for direct money returns would undoubtedly prove to be

[1] For further information relative to protection from blister rust consult your State forester or the Bureau of Plant Industry, United States Department of Agriculture.

DENUDED HILLS
MEAN—
Floods.
Clogging of streams, lakes, and reservoirs.
Waste of soil.
Destruction of prosperous farms and other industries.
DEVASTATION.

a losing investment. Here, however, considerable forest planting goes on, but on relatively small, isolated tracts on farms and for special purposes, depending upon local conditions. Forest trees are planted chiefly to check soil erosion on slopes; to afford a windbreak as shelter for growing crops, live stock, and man; and to utilize to the best advantage rough, stony, or poor soils and inaccessible and wet lands.

In western Tennessee, where the soil is a very deep, rich, clay loam, known locally as "brown loam," forest planting is being extensively pushed by the State as a means of reclaiming and making profitable badly eroding lands and at the same time checking at the source of the small streams the silting which results in expensive dredging operations on the Mississippi River and its navigable tributaries. Similar conditions prevail over large areas in other States of the Mississippi Basin and in the Piedmont section and lower slopes of the Appalachians.

On the farms of the eastern United States many thousands of acres of slopes have been cleared and become waste from which the forest should never have been removed. Careful cutting by the selection method would have resulted in keeping the land continuously productive. This mistake is still going on in some rural sections where foresight and study have not yet been generally applied to farm management.

FORESTED HILLS
Protect the soil.
Store up water.
Feed springs and streams.
Support prosperous farms and other industries.
PROTECTION.

PROFIT IN GROWING TIMBER.

AN EXAMPLE.

This white pine, which was planted on an abandoned sidehill pasture of about 3 acres in New Hampshire 44 years ago, now contains about 90,000 board feet of lumber. The total outlay at the time, counting the value of the land and labor of planting, was $35. The timber to-day is worth on the stump something over $1,500.

The farmer had this strip of practically worthless sidehill, and with some spare time on hand dug up 1,400 seedling pines growing in a thicket and set them out. About 20 years later the farmer died and among his assets was this small tract of young pine for which, much to her surprise, the widow was offered $300. The second owner retained it for about 15 years and then, wishing some money, sold it. Soon afterwards it came into the hands of the present owners, a lumber company, for something over $1,000.

Assuming a land value of $5 per acre, and a charge for taxes and oversight for the period averaging $2 per acre per year, the operation has yielded a return of 5 per cent on the total investment in land, labor, and annual outlay, and in addition a neat sum equivalent to a yearly net profit from the start of over $5 per acre.

Forest-tree planting is practicable as a means of improving the quality of the woodland and increasing the quantity and value of its product. Through carelessness, cutting, fire, and other agencies many woodlands have fallen far below their maximum capacity of production. By the application of a little intelligent guidance in making proper improvement cuttings and by affording protection from grazing animals and fire it is often possible within the period of a few years to bring about a marked change for the better in the composition and quality of the woodland. This method often succeeds better than planting trees. This is illustrated by the experience of woodland owners. A progressive farmer in Summit County, Ohio, wishing to handle his woodlands rightly, excluded all live stock by fencing and at the same time planted catalpa in the larger openings in his woods. In 10 years the forest floor, instead of being bare and packed hard, consisted of a deep layer of spongy organic matter, affording protection to the roots of the trees. A complete understory of young yellow or tulip poplars, hard maple, beech, elm, white oak, hickory, and ash had sprung up. The volunteer poplars, it should be carefully noted, had grown to from 6 to 12 feet in height and completely overtopped and suppressed the planted catalpa. Since the poplars were the more valuable of the two species because of their rapid rate of growth and the useful quality of the lumber, nature had beaten the owner at his own game. By making proper thinnings, then, in 5 years the woodland was brought to the very satisfactory condition of having a good stand of valuable species of trees filling all the openings and coming on to take the place of the mature trees as cut.

In choosing species for planting it is always best to consider first the most desirable kinds of native trees, since they are already acclimated to the local conditions and are least subject to failure. In general, the various conifers, including the pines, are to be recommended for planting in most sections of the country because they are quick growing and yield softwood, which is in more demand than the hardwoods. Cottonwood, which holds the record for the fastest production of wood, is a good tree for relatively moist situations of good soil. Black locust takes root quickly on dry slopes and possesses to a marked degree the ability to hold the soil against agents of erosion. (Fig. 12.) It is somewhat limited in its range of successful growth by a locust boring beetle, which, however, can be controlled to a great extent by means of proper spacing and handling of plantations.[1] Black walnut is probably one of the best kinds of trees for the farm, owing to the high quality and value of its wood

[1] Refer to U. S. Department of Agriculture Bulletin 787, "Protection from the Locust Borer."

and its production of edible nuts. The more desirable trees for the farm to be favored in planting over a large region of the Eastern States include also the faster-growing red oaks, white oak, ash, hickory, and yellow poplar.[1]

The planting of forest trees for shade, nut production, and ornamental purposes, as the original timber becomes scarcer, has an increasing place of importance on our farms and likewise in the towns and cities.

Information regarding the kinds of trees, ways of obtaining seed or seedlings, methods of sowing and planting, and the care of trees can be had upon application to the various State foresters or the Forest Service, U. S. Department of Agriculture. Some of the

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FIG. 12.—Black locust planted on waste land, supplying the farm with fence posts and enriching the soil.

State foresters, in addition to furnishing information, supply tree seedlings of the most desirable species at cost prices.

Next to the improvement of existing woodlands by proper handling and good methods of marketing the products, no branch of farm forestry is of greater importance than forest planting.

ADDITIONAL INFORMATION.

(1) Additional information on forestry may be secured by writing to the Forester, Forest Service, Washington, D. C. A list of available forestry publications can be obtained, including those bear-

[1] Much practical information on what to plant and how to plant forest trees is found in Farmers' Bulletin 1085, "Growing and Planting Hardwood Seedlings on the Farm."

ing directly on the subject of forestry for the farm. Some of the more important are:

Basket Willow Culture (Farmers' Bulletin 622).
Care and Improvement of Farm Woods (Farmers' Bulletin 711).
Measuring and Marketing Farm Timber (Farmers' Bulletin 715).
Cooperative Marketing of Woodland Products (Farmers' Bulletin 1100).
Preservative Treatment of Farm Timber (Farmers' Bulletin 744).
Waste Land and Wasted Land on Farms (Farmers' Bulletin 745).
The Windbreaks as a Farm Asset (Farmers' Bulletin 788).
Advice to Forest Planters in the Plains Region (Farmers' Bulletin 888).
The White Pine Blister Rust (Farmers' Bulletin 742).
Machinery for Cutting Firewood (Farmers' Bulletin 1023).
Making Woodlands Profitable in the Southern States (Farmers' Bulletin 1071).
Growing and Planting Hardwood Seedlings on the Farm (Farmers' Bulletin 1085).
Beautifying the Farmstead (Farmers' Bulletin 1087).
Street Trees (Agricultural Department Bulletin 816).
The Status and Value of Farm Woodlots in the Eastern United States (Agricultural Department Bulletin 481).
Use of Wood for Fuel (Agricultural Department Bulletin 743).
Small Sawmills (Agricultural Department Bulletin 718).
Protection from the Locust Borer (Agricultural Department Bulletin 787).
Protection of Forests from Fire (Forestry Bulletin 82); price, 15 cents.

(2) Circulars or bulletins on various phases of home forestry have been published by most of the State foresters. No attempt is made here to list these publications, but applications for information on forestry should be addressed to the various extension specialists in forestry connected with the State agricultural colleges, to the county agents, or to the State forestry departments, as follows:

State.	Official.	Address.
Alabama	State commisssioner of forestry	Montgomery.
California	State forester	Sacramento.
Colorado	State forester	Fort Collins.
Connecticut	State forester	New Haven.
Idaho	State commissioner of forestry	Boise.
Indiana	Secretary, State board of forestry	Indianapolis.
Iowa	State forestry commissioner	Des Moines.
Kansas	State forester	Manhattan.
Kentucky	Commissioner of geology and forestry	Frankfort.
Louisiana	Superintendent of forestry	New Orleans.
Maine	Forest commissioner	Augusta.
Maryland	State forester	Baltimore.
Massachusetts	State forester	Boston.
Michigan	State forester	Roscommon.
Minnesota	State forester	St. Paul.
Montana	State forester	Helena.
New Hampshire	State forester	Concord.
New Jersey	State forester	Trenton.
New York	Superintendent of forests	Albany.
North Carolina	State forester	Chapel Hill.
North Dakota	State forester	Bottineau.
Ohio	State forester	Wooster.
Oregon	State forester	Salem.
Pennsylvania	Commissioner of forestry	Harrisburg.
Rhode Island	Commissioner of forestry	Chepachet.
South Dakota	Forest supervisor	Custer.
Tennessee	Forester of State geological survey	Nashville.
Texas	State forester	College Station
Vermont	Chief forester	Montpelier.
Virginia	State forester	University.
Washington	State forester	Olympia
West Virginia	Forest warden	Philippi.
Wisconsin	Conservation commissioner	Madison.

(3) Sets of about 50 colored lantern slides, each, accompanied by a syllabus, or lecture, will be loaned to schools and other educational agencies by the Forest Service for short periods on condition that borrowers agree to pay transportation charges, to be responsible for slides lost or broken, and to forward the slides promptly and in good condition upon request. Application should be made as far in advance of the need as possible, since the sets are usually engaged for a considerable time in advance. The subjects upon which sets are available are:

Forestry in Agriculture.
Farm Forestry in the South.
Tree Windbreaks.
Street Trees.
Farm Woodlands.
Nature Study and Forestry.
Botany and Forestry.
Manual Training and Forestry.
Geography and Forestry.
Life of a Tree.
Conservation of the Forest.
Forestry in the United States.
The Work of the Forest Service.
Recreation on National Forests.

Application should be made to the Forester, Forest Service, Washington, D. C., for the loan of any of the above sets of lantern slides.

F-21513

FIG. 13.—Forest trees needed to check soil erosion and make land bring an income.

WOODLANDS on farms in the eastern half of the United States would form a strip 105 miles in width reaching from New York to San Francisco.

Farmers own as much forest land as do all the lumbermen and other private holders together.

Farms contain more than one-half the entire hardwood forest area of the United States.

Woods occupy a larger part of the farms of this country than does any other crop; in fact as much as all the cereal crops combined.

The haphazard cutting of trees with no plan or thought for the future invariably results in the deterioration of the woods, both in quality and value. Often the rapid-growing, straight trees are cut because they can easily be worked up, and yet these are the very ones that should be left to develop into high-grade timber.

Using good pasture land to support scrub stock and devoting woodland to the growing of inferior trees are both examples of mismanagement on the farm.

Many woodlots on farms consist of park-like stands of defective trees having little commercial value. The forest should be so dense that little grass can grow. If stock need additional shade some woodland may be included in the pasture. The attempt to combine stock grazing with timber growing in farm woods is neither good grazing practice nor profitable forestry.

A forest without young growth is like a community of old people; it will die out.

Timber is a national necessity; the supply of it is being rapidly depleted. By growing more timber, the farmer increases his own income and benefits the public.

On the poorer lands of many farms in the United States white pine, ash, oak, hickory, poplar, black walnut, cottonwood, black locust, shortleaf pine, or slash pine is the best-paying crop.

On remote farms, where buyers formerly would make no offer on less than a carload of timber, good roads and the motor truck have made it possible for the farmer to sell individual trees at fair prices.

On account of big increases in prices the total value of the timber product for farm woodlands in 1919 is estimated to have risen to about double that of 1910, or to about $400,000,000.

FORESTRY INCREASES FARM INCOME BY

1. Making waste lands yield a profit by growing timber on

Poor soils	Wet lands
Steep slopes	Unused corners
Rocky lands	Eroded lands.

2. Furnishing paying employment for men and teams during the winter.
3. Utilizing timber better on the farm and avoiding waste by
   - Cutting low stumps and small tops,
   - Using substitute woods in construction,
   - Treating nonlasting woods.
4. Increasing crop yields by planting forest tree windbreaks.
5. Growing more and better timber on the farm through
   - Protecting the woods from fire and overgrazing,
   - Selecting for cutting the mature, defective, overcrowded, and inferior kinds of trees, and leaving the straight, thrifty, and better kinds,
   - Planting to fill openings in woods.
6. Marketing the higher grades of wood products direct to consumers at fair prices as

Saw logs	Posts
Poles	Pulpwood
Piling	Firewood
Cooperage bolts	Spoke blocks
Handle bolts	Tannin bark.

MAKE YOUR WOODLAND PERMANENTLY PROFITABLE.

Good Timber Wasted
by Woods Fires

eserve

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1117

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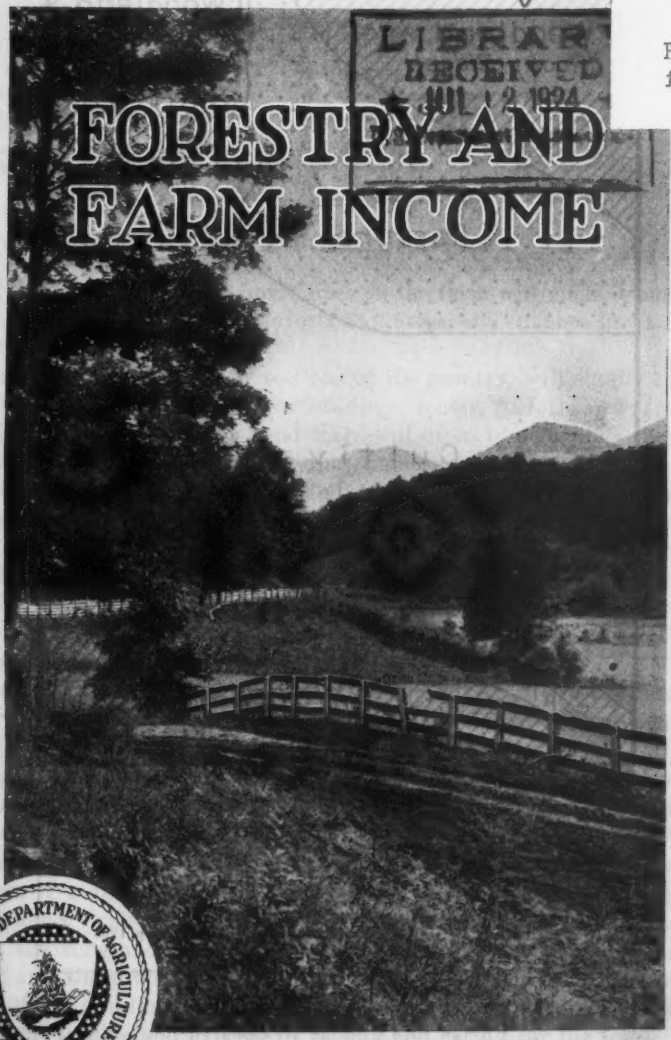
FORESTRY AND FARM INCOME



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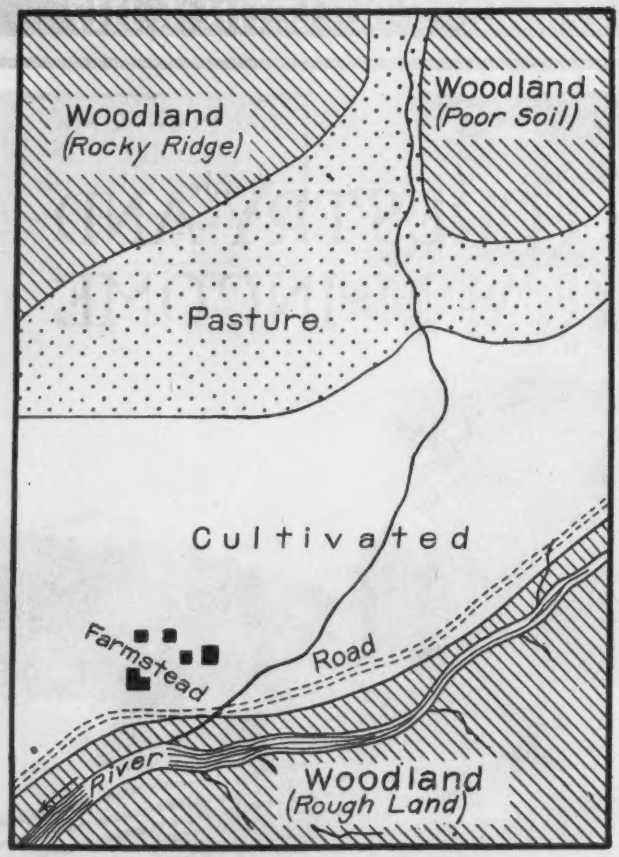
NO IDLE LAND ON THE FARM.



Woodland on the hills, pasture land on the slopes, and cultivated land below.

Washington, D. C.

Issued August, 1920
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FORESTRY AND FARM INCOME.

WILBUR R. MATTOON,
Extension Specialist in Forestry.

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WHY FARM FORESTRY PAYS.

THE right handling of forest trees on the farm will make it more prosperous, add to its comforts as a home, and enhance its value as an investment.

The home forest, in many sections of the country, will supply the timber which the farm needs for buildings, fences, fuel, repairs of all kinds, and many other uses; and there will often be a surplus which can be sold in the form of standing timber, saw logs, posts, poles, crossties, pulpwood, fuelwood, and blocks or billets for making spokes, handles, spools, boxes, barrels, and excelsior.

A well-cared-for home forest serves also as a windbreak for buildings, a shelter for live stock, a protection of valuable lands from erosion, a means of profitable employment for men and teams during otherwise spare or idle time, a place of recreation, and an improvement in the appearance of the farm.

Trees improve and build up the soil. The leaves, small twigs, and other tree litter decompose and form a layer of dark-colored vegetable mold, which enriches the soil and stores up soil moisture. By means of this layer of mold, the binding of the soil by the roots of the trees, and the resistance of the trunks to the rapid flow of water, the woods prevent floods from gullying or destroying the land by erosion, particularly on steep slopes.

Even if a farmer sells no timber the woodland pays. The firewood, fence posts, and material for repair and construction on the farm, the time and money saved by having them conveniently on hand, and the protection against extremes of weather afforded the crops, farm buildings, and stock are worth considerably more than the slight trouble and expense of raising and caring for the trees.

The woods need not occupy good farm land that will grow other crops. Trees should, as a rule, be located on land too poor to cultivate, such as gullied or very rocky land, swamps, steep slopes, and barren soils. Unused corners and small uncultivated spots about the farm are good places for rapid-growing, useful trees. The chief economic reason for timber growing on the farm is to get a profit from those portions which would otherwise be unproductive.

Though the land on which the farm forest is situated may not be suitable for other crops, it should not be treated as waste land. (Fig. 1.) By a little care it can be made to produce valuable timber. Only a little attention is required, and this may be given in the winter or when other farm work is slack. Forest trees and woodland are

F-121668

FIG. 1.—Timber for the farm and for market, and shelter for the farmstead from woodland covering a stony ridge.

more valuable now than they were a few years ago. Many trees that used to have little value, and even small trees that used to be counted as brush to be got rid of, are now in good demand.

A permanent woodland is an essential part of a well-equipped farm; and more than ever before farm woodland has become a valuable asset convertible into money.

EXTENT OF FARM WOODLANDS.

About one-third of all the forest land of the United States is on farms. According to the latest available figures (1920 census) this means that the farm woodlands amounted in all to about 168,000,000 acres. This is equivalent, roughly, to the aggregate area of Pennsylvania, Virginia, Ohio, Indiana, Illinois, Kentucky, and Tennessee.

If placed contiguous it would form a solid strip 100 miles in width reaching from New York to San Francisco. In the eastern United States—east of the Plains—the total woodlands on farms amounted to about 150,000,000 acres. (Fig. 2.) Farm woodlands in the eastern United States comprise an area nearly seven times as large as the entire forest lands of France, which furnished practically all the

FIG. 2.—Important farm woodland regions.

timber required during the war by the armies of France, Great Britain, Belgium, and the United States.

Assuming that every farm in the eastern United States has some woodland, there is an average of about 26 acres per farm. The amount of woodland on farms varies widely, however, in the different sections of the country. The important woodland region of the East-

ern United States is shown with its subdivisions in Figure 2. The average area of woodland per farm, the average proportion of the farm that is wooded, and the total woodland in the United States are shown in the following table:

States (by groups).	Average area of woodland per farm.	Proportion of farm land wooded.	Total area of farm woodland.
	Acres.	*Per cent.*	*Acres.*
New England (Me., N. H., Vt., Mass., R. I., Conn.)	44.8	41.3	7,020,311
Middle Atlantic (N. Y., N. J., Pa.)	20.4	21.3	8,659,237
South Atlantic (Del., Md., D. C., Va., W. Va., N. C., S. C., Ga., Fla.)	36.1	42.8	41,802,263
Lake (Mich., Wis., Minn.)	23.2	18.3	13,101,566
North Central (Ohio, Ind., Ill., Iowa, Mo.)	17.3	14.0	20,291,681
South Central (Ky., Tenn., Ala., Miss., Ark., La., Okla., Tex.)	28.4	23.0	58,163,676
Plains (N. Dak., S. Dak., Nebr., Kans.)	7.8	2.2	3,430,045
Mountain (Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.)	28.2	5.9	6,887,071
Pacific (Wash., Oreg., Calif.)	35.8	14.9	8,374,944
Average per farm and total	26.0	17.5	167,730,794

VALUE OF WOODLAND PRODUCTS.

Considerable income may be derived from the home forest. The total value of forest products taken from timbered land on farms reported in the 1920 census was $394,321,828. Nearly half of this represents the value of wood and various minor wood products used on the farm and the rest the value of the products sold or cut and

TIMBER RAISING IN EASTERN UNITED STATES PAYS BECAUSE—

1. There is plenty of cheap land unfit for agriculture.
2. The abundant rainfall permits rapid tree growth.
3. Transportation facilities by rail and water are good.
4. Numerous large cities furnish an adequate market.
5. The region is far removed from the virgin supplies of the Pacific Northwest.

held for sale. For the farms reporting, this amounts to an average of about $217 per farm. Nineteen States reported over $10,000,000 each in forest products from their farms; and four—Virginia, North Carolina, Georgia, and Tennessee—reported more than $20,000,000 each.[1]

Firewood is one of the important crops of the farm. In 1920 an average of 10.6 cords of wood, or a total of 68,244,000 cords, were burned on the farms of the country. Piled continuously, this would reach four times around the world. The total production of cord-wood during the year, which includes wood burned on farms and that sold by farmers to city dwellers, is estimated at not less than 90,000,000 cords. The average farm value in 1920 was $5.07 a cord. The figures show that farmers in the Southern States are the heaviest fuel-wood users. North Carolina and Tennessee lead with an average of 17 cords used on each farm during the year. The farms of Vermont, Virginia, and Arkansas averaged 15 cords; Kentucky, 14 cords; Michigan, Georgia, and Alabama, 13 cords; Maine, New Hampshire, Connecticut, Wisconsin, South Carolina, and Missouri, 12 cords.

SECURING GOOD FOREST GROWTH.

At present farm woodlands are yielding, as a rule, only from one-third to one-half the wood they could grow. This is because only a few farmers realize the possibilities in their woodlands and give them proper care. As a result the home forest, which is close at

$1 A DAY PROFIT.

A NEW YORK FARMER'S WOODLAND OF 115 ACRES EARNS HIM A CONTINUOUS PROFIT OF $1 A DAY.

The annual growth is 0.65 cord per acre.
115×0.65=75 cords (mostly poplar).
He cuts an annual crop of 75 cords.
His profit is $4.86 per cord.
75×$4.86=$364.50.

[1] More than three-quarters of the present total timber supply of the United States is on privately owned lands. Much has been said about the National Forests, but the fact is that they contain somewhat less than one-quarter of the country's timber, and the timber now being cut from them represents only about 3 per cent of the entire consumption. The rest comes from private lands.

hand, where a little attention each year in protecting, cutting, and utilizing the timber would be very profitable, is in poor condition.

The amount of timber that an acre can grow in a year varies a good deal with the quality of the soil and moisture supply and the kind and number of the trees per acre. If fully stocked with trees and well cared for, an acre of hardwoods should grow yearly from about one-half to 1 cord of wood and of pine from 1 to 2 cords, a cord being equivalent to about 500 board feet of saw timber. Growth averages rather less in the northern part of the country because of the shorter season and somewhat more in the warmer southern part.

The chief essentials in keeping the trees growing are excluding fires and allowing the humus to collect on the forest floor. Large openings in the woods reduce the annual yield of timber and should not be allowed to occur. The length of time required to reach merchantable size varies with the kind of tree and the use to which its wood is to be put. Posts and crossties may be grown in from 10 to 30 years, and most kinds of quick-growing trees will be large enough for saw timber in from 20 to 40 years.

After logging, a new stand of young trees generally starts naturally from seeds or sprouts from stumps. The natural seeding process in the woods can be helped by harrowing the ground or, before the seed falls, turning hogs into the woodland, both of which enable the seed to get in contact with the mineral soil, or by conducting logging operations in a good seed year before the seed falls, so that it germinates quickly.

A WHITE PINE STAND IN NEW HAMPSHIRE GROWS 1,000 BOARD FEET A YEAR.

Two acres of white pine, near Keene, N. H., were sold several years ago, before the war prices, for $2,000 on the stump. The total stand was 254 cords, which equals 170,000 board feet, or an average of 85,000 feet per acre. The trees were from 80 to 85 years old; so the growth on each acre was about 1,000 feet per annum and the gross returns about $12.20 per acre per annum.

Some points to be remembered about trees which sprout are: (1) The most thrifty sprouts come from clean, well-cut stumps felled during the late fall, winter, or very early spring before the sap begins to flow; and (2) the top of the stump should be cut slanting, so as to shed water. Trees which sprout successfully include such

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FIG. 3.—Thrifty woods, good crops, and a happy farmer.

hardwoods as the oaks, hickories, chestnut, basswood, gums, cottonwood, and willows, and young short-leaf and pitch pines.

Woodlands may also be restocked with young trees by sowing seed or planting out small seedlings grown in nursery beds or dug up in the woods. If trees are to be planted, it is well to select those native to the region which grow most rapidly and produce the most useful kinds of wood.

TREES TO CUT FOR IMPROVING THE WOODS.

Trees which are well suited for firewood, and the removal of which will be an improvement to the remaining trees in the stand.

Trees which have been overtopped by others and have had their growth stunted.

Diseased trees, or trees seriously injured by insect attacks, or trees extremely liable to such injury; for example, chestnut in the region subject to blight or birch in the gipsy-moth area.

Badly fire-scarred trees.

Trees of the less valuable species, such as beech, birch, black oak, black jack oak, or black gum, crowding the more valuable sugar maple, white or shortleaf pines, yellow poplar, or white oak.

Crooked trees and large-crowned, short-boled trees which will not make good lumber and which are crowding or overtopping others.

Slow-growing trees crowding fast-growing species of equal value.

Sound dead trees, both standing and down.

IMPROVING THE WOODS BY CUTTING.

Cutting should be done so as to cause the least possible waste or damage to other living trees, particularly young trees. In felling trees, advantage should be taken of natural openings in the woods.

Good management should result in a home forest fully stocked with sound, well-shaped trees of valuable and useful kinds that are growing as fast as possible. This can be brought about largely by cutting out the inferior kinds—the "weed" trees—for exactly the same reason that weeds are hoed out of the cornfield. The good trees need the light, space, soil moisture, and plant food that would

F-4108

FIG. 4.—Woods improved by right cutting.

otherwise be taken by the less valuable trees. Sometimes it becomes advisable to fill openings or improve the quality of the woods by planting seeds or seedlings of desirable kinds of trees.

What sort of trees should be removed? Dead and dying trees; diseased trees; deformed trees which shade out better ones; the less valuable kinds, such as gray birch, aspen, blackjack oak, dogwood, sourwood, blue beech, ironwood, and others; and the less promising trees in crowded groups. By following this practice each year improvement in the forest is brought about in a relatively short time.

The wood removed in improvement cuttings need not be a loss. It should be considered as an early crop that can be used or sold, generally at a price to show a profit on the work of thinning, while the woods are made more valuable by its removal.[1]

[1] See Farmers' Bulletin 1177, "The Care and Improvement of Farm Woods."

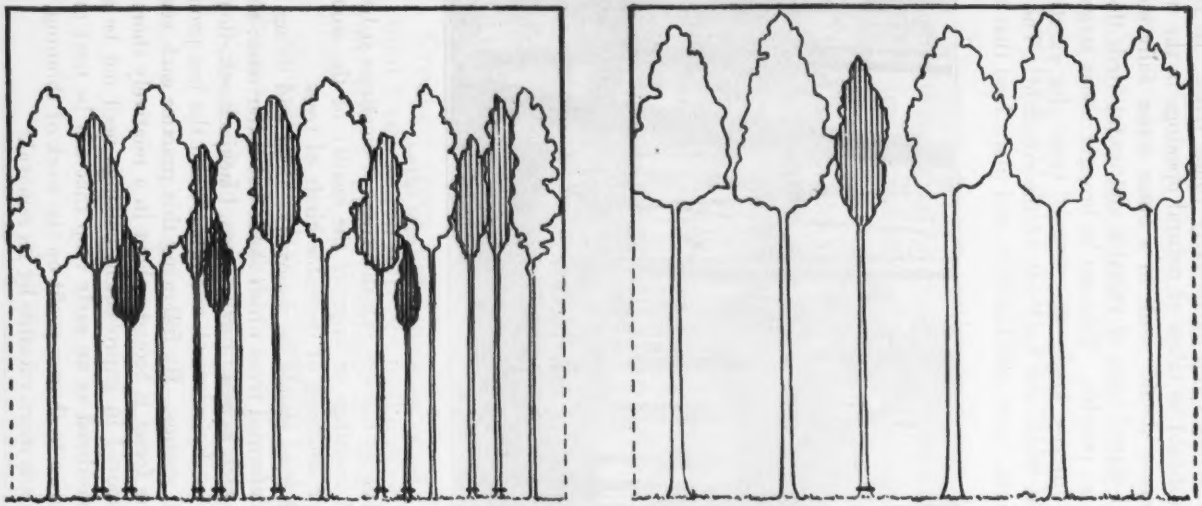

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FIG. 6.—The growth and value of pine are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber. (A) Before thinning—15 overcrowded trees. (Shaded trees to be cut.) (B) The same stand 5 years later after thinning—6 larger and more valuable trees. (Shaded tree to be cut).

ESTIMATING AND SELLING TIMBER.

When timber is no longer growing at a profitable rate it should be cut and used or sold. A farmer who is ready to sell timber would profit by measuring his trees, estimating how much saw timber or

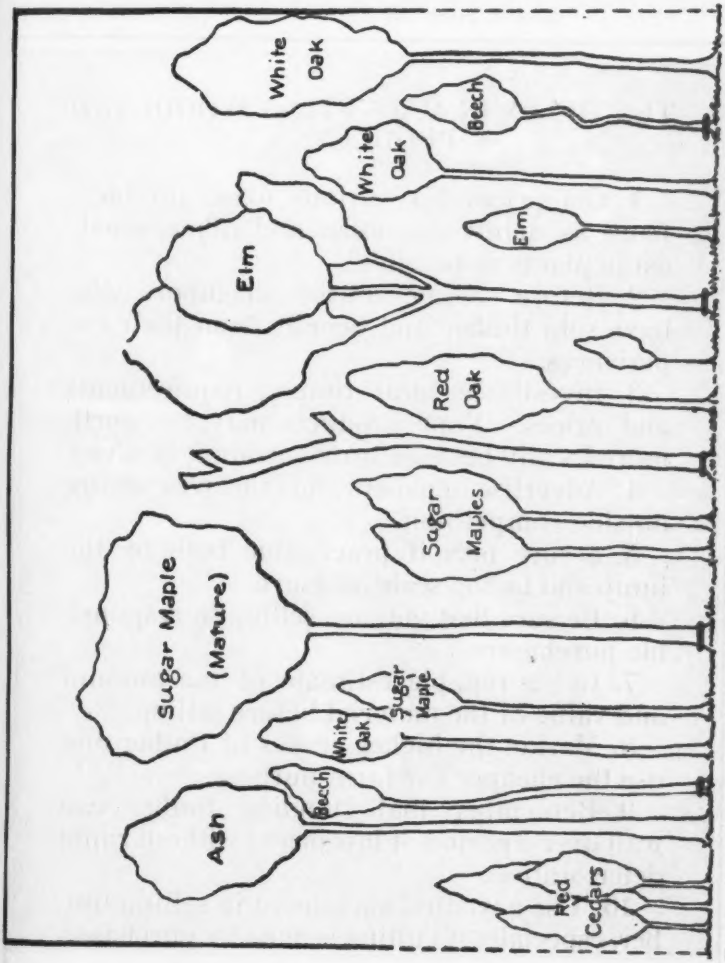

FIG. 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species to be cut. A good stand left of thrifty middle-aged and promising young trees.

other products they contain, and making inquiry to find out how much they are worth. If he does not know or can not find out how to do this, he should employ some experienced and reliable person to estimate and value his timber for him.

The customary units of measure in selling farm timber are board feet, cords, linear feet, and the piece. A board foot, for example, is 12 inches long, 12 inches wide, and 1 inch thick, or its equivalent.

TEN HELPS IN MARKETING WOODLAND PRODUCTS.

1. Get prices for various wood products from as many saw mills and other wood-using plants as possible.
2. Before selling, consult neighbors who have sold timber and benefit from their experiences.
3. Investigate local timber requirements and prices. Your products may be worth more locally because transportation is saved.
4. Advertise in papers and otherwise secure outside competition.
5. Secure bids if practicable both by the lump and by log-scale measure.
6. Be sure that you are selling to responsible purchasers.
7. Get a reliable estimate of the amount and value of the material before selling.
8. Market the higher grades of timber and use the cheaper for farm purposes.
9. Remember that standing timber can wait over a period of low prices without rapid deterioration.
10. Use a written agreement in selling timber, especially if cutting is done by purchaser.

The standard cord of wood is 4 feet high, 4 feet wide, and 8 feet long. The linear foot is a measure of length only, without regard to the other dimensions of the material. Piece measure is only a count of the pieces in any form in which the wood is sold.

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FIG. 7.—Fast-growing hickory is one of the most marketable forest trees. It is in strong demand for spokes and implement handles.

Logs and standing trees are usually estimated in board feet. Saw timber is measured in board feet. Round timber, such as poles and piling, is usually sold by the linear foot. Firewood, pulpwood, and wood for distillation and other uses cut in short lengths are usually sold by the cord. Fence posts, ties, telephone poles, and some other forms of timber are sold by the piece.

FARM WOODLAND IN THE NORTH.

Farm woodlands amount to two-fifths of all forested lands.

There are about 53,000,000 acres of farm woodland.

In New England more than 65 per cent of all forested land is on farms, and in Ohio, Indiana, Illinois, and Iowa from 80 to 100 per cent.

The income to farms from timber products is estimated at about $198,000,000 yearly.

Saw timber in the standing tree is estimated by measuring the diameter of the tree, outside the bark, at breast height (4½ feet above the ground), and measuring or estimating the height of the tree. When these measurements are known the contents of the tree can be found from a volume table.[1] Often the length of the part of the trunk to be used is taken in units, or number of 16-foot logs, instead of the total height of the tree.

A volume table is one showing in board feet the amount of timber that can be sawed from trees of given heights and diameters or from a given number of merchantable logs and diameters. For example, a volume table for white oak would show that a tree 18 inches in diameter (measured outside the bark at breast height) and having three merchantable 16-foot logs will saw out 286 board feet of lumber Volume tables are made for different kinds of trees, each table based on the average of many measures of felled trees.

A saw log is measured by taking the length of the log and its diameter inside the bark at the small end, then employing a log rule to estimate the amount or number of board feet it contains. A log rule is a statement of the estimated number of board feet of lumber that can be sawed from logs of different lengths and sizes. A good rule for 12-foot logs is to multiply the diameter inside bark at the small end by half the diameter. For shorter logs the contents will be proportional to the length of the logs. Thus, a 12-foot log 16 inches in diameter will saw out about 16×8 or 128 board feet, while a 10-foot log 14 inches in diameter will cut $\frac{10}{12}$ of 14×7, or 81⅔

[1] For volume tables and other information on estimating and measuring timber, see Farmers' Bulletin 1210 or apply to State foresters.

FARM WOODLAND IN THE SOUTH.

Woodlands on farms comprise one-half of all the forested lands.

There are more than 100,000,000 acres of farm woodland.

In Maryland, Virginia, North Carolina, Kentucky, and Oklahoma, more than 60 per cent of all forest land is on farms.

The present yearly farm income from woodlands is estimated at about $190,000,000.

board feet. The Doyle rule is probably most commonly used in this country. To determine the number of board feet in a log by this rule deduct 4 inches from the diameter of the small end, then square one-fourth the remainder and multiply the product by the length in feet. For example, a log measuring 20 inches at the small end and 12 feet long contains 192 feet. This is not an accurate rule for small-sized timber, since it shows one-half to one-fourth fewer board feet in logs from 6 to 20 inches in diameter than are actually sawed out in the mill. For logs larger than 20 inches it is fairly accurate. In buying and selling operations the value placed on small logs is sometimes made to take into account the small scale on the basis of the Doyle rule, but more often the seller is the loser.

FARM FORESTRY MAKES FARMING PAY BETTER BY—

1. Marketing timber profitably.
2. Supplying timber for farm needs.
3. Furnishing employment for men and teams in winter.
4. Making waste lands yield a profit.
5. Increasing the sale value of the farm.

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For handy reference the Champlain and Doyle log scales are given (Tables 1 and 2) for logs measuring from 6 to 25 inches in diameter. The former scale shows approximately the amount of lumber that can be sawed out in small mills using circular saws, cutting ¼-inch saw kerf but operated carefully without unnecessary waste and otherwise closely utilizing the timber.

TABLE 1.—*Champlain Log Scale.*[1]

Diameter of log (between bark at small end).	Length of log, in feet.								
	8	9	10	11	12	13	14	15	16
	Contents of log, in board feet.								
Inches.									
6	11	12	14	15	17	18	19	21	22
7	16	18	20	22	24	26	28	30	32
8	21	24	27	30	32	35	38	40	43
9	28	31	35	38	42	45	49	52	56
10	35	40	44	48	53	57	62	66	70
11	43	49	54	60	65	70	76	81	87
12	52	59	65	72	78	85	92	98	105
13	62	70	78	85	93	101	109	116	124
14	73	82	91	100	109	118	127	136	146
15	84	95	105	116	126	137	147	158	168
16	97	109	121	133	145	157	169	181	193
17	110	123	137	151	165	178	192	206	219
18	124	139	155	170	186	201	217	232	247
19	139	156	173	190	208	225	242	260	277
20	154	173	193	212	231	251	270	289	308
21	171	192	213	235	256	277	299	320	341
22	188	212	235	259	282	306	329	353	376
23	206	232	258	284	309	335	361	387	412
24	225	253	282	310	338	366	394	422	450
25	245	276	306	337	368	398	429	460	490

TABLE 2.—*Doyle Log Scale.*[2]

Diameter of log (between bark at small end).	Length of log, in feet.					
	6	8	10	12	14	16
	Contents of log, in board feet.					
Inches.						
6	1.5	2	2.5	3	3.5	4
7	3.4	4.5	5.6	6.8	7.9	9
8	6	8	10	12	14	16
9	9	12	16	19	22	25
10	13	18	22	27	31	36
11	18	24	31	37	43	49
12	24	32	40	48	56	64
13	30	40	51	61	71	81
14	37	50	62	75	87	100
15	45	60	76	91	106	121
16	54	72	90	108	126	144
17	63	84	106	127	148	169
18	73	98	122	147	171	196
19	84	112	141	169	197	225
20	96	128	160	192	224	256
21	108	144	181	217	253	289
22	121	162	202	243	283	324
23	135	180	226	271	316	361
24	150	200	250	300	350	400
25	165	220	276	331	386	441

[1] The Champlain rule shows approximately the amount of lumber cut from logs by close sawing. The full table includes logs up to 60 inches in diameter.

[2] The Doyle rule was originated at the time of abundant and cheap timber. It gives a much smaller scale for small-sized logs than is actually sawed out according to present custom. The full table runs to and includes logs 40 inches in diameter.

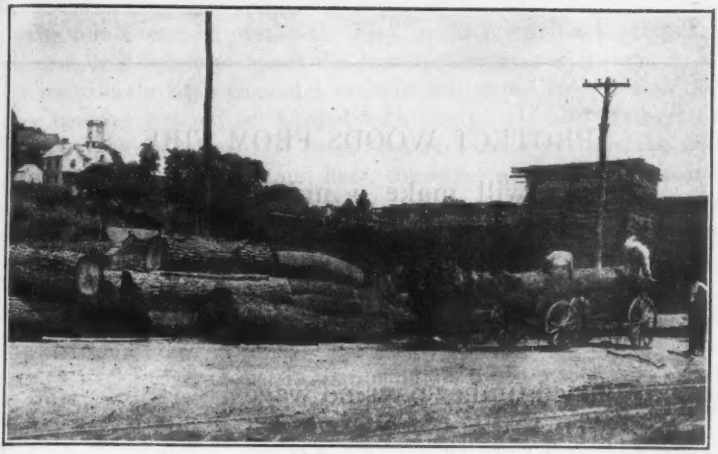

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FIG. 8.—Choice logs bring high prices and are often shipped long distances.

In finding a buyer for his timber the owner should inquire of his neighbors who have sold, or at local sawmills, wood yards, wood-using factories, railroad stations, and telegraph and telephone companies. He should also advertise in the papers and write personal letters furnishing a brief description of the kind, quality, and amount of timber for sale, in order to awaken competition among local and outside buyers. Securing a number of bids for the same piece of timber will tend to develop the best market and increase returns. It is well to have a written agreement as to the manner in which the timber shall be cut, the amount and form of payment.[1]

Some of the industries buy their supplies largely or wholly in the log; hence, in many cases it will pay the farmer to look up these special markets for his logs, bolts, poles, ties, etc. Industries buying their supplies more or less generally in the form of round timber are manufacturers of handles, cooperage, veneer, woodenware and novelties, shuttles, bobbins and spools, vehicle stock, athletic goods, and pulpwood. Poles are purchased by electric lighting, power, and telephone companies. Markets for piling will be found by applying to railroads, wharf, bridge, and bulkhead contractors in the larger towns and cities. For prices on ties, consult the nearest local railroad station agent. Cordwood is used by brickmakers, bakeries, limekiln operators, and fuel dealers in towns.

[1] A sample contract and a good many helpful points on measuring and selling farm forest products may be found in Farmers' Bulletin 715, "Measuring and Marketing Farm Timber," and Farmers' Bulletin 1100, "Cooperative Marketing of Woodland Products."

PROTECT WOODS FROM FIRE.

A tree will make a million matches—a match may destroy a million trees.

Take no chances with lighted matches, tobacco, brush or camp fires.

Forest destruction is quick—forest growth slow.

Burned timber pays no wages.

When fire is discovered, put it out if you can. Get help if you need it.

ARE YOU PRACTICING PREVENTION AND FOREST PROTECTION?

HELP PREVENT WOODS FIRES.

BE SURE your match is out before throwing it away.

DON'T throw away burning tobacco.

CHOOSE a safe place and make your camp fire small.

PUT OUT your fire with water and then cover it with earth.

DON'T make large brush heaps. Choose a still day for burning, and plow furrows to protect near-by woods.

BE CAREFUL WITH FIRE.

FIRE PROTECTION.

The forest must be protected. Fire, grazing, careless logging, tree diseases, and insect pests are the principal sources of injury.

Fire kills the little trees and weakens full-grown trees so that they may become diseased or infested with insects. It also destroys the humus cover of leaves and twigs that ordinarily protects the trees against summer drought and heat, conserves water for the springs and streams, and enriches the soil by adding nitrogen. The loss of this natural fertilizer by burning amounts to a very large sum, entirely sufficient to warrant complete fire protection of the country's forests.

Burning over the ground with the aim of improving grazing is an expensive mistake. Although it is possible to secure green grass for stock a week or two earlier in the spring, most of the rich leguminous plants and annual grasses are exterminated, leaving as survivors only the hardy bunch, wiry, and other coarse perennial grasses.

Dead trees and tops cut in logging are a fire menace and should, if possible, be utilized. Sawlogs or firewood can be made out of the dead trees and the unused large tops should be lopped so that they will lie close to the ground and rot quickly.

Some idea of the prevalence of fires in the eastern United States, including the Mississippi Basin, may be formed from the fact that here occur 80 out of every 100 forest fires. For the five years of 1916 to 1920, inclusive, an average of 24,600 fires yearly in this region burned over 10,000,000 acres of land and caused a property loss amounting yearly to more than $14,400,000. While fires were reported from all States, a greater number of fires and larger losses occurred in the southern pine district than in any other important forest region.

Are there any laws about forest fires? Yes. Practically every State has strict laws against the setting of fire and carelessness in the burning of brush. In a number of States the railroads are required to use efficient spark arresters in their locomotives and burn fire lines along their rights of way.

Forest fire protective systems have been established by a number of States. Patrolmen are employed who travel the regions where there is danger of forest fires, watch for fire, and educate the public in the need for care in preventing fire and for getting quickly to any fire that may occur. Owners of woodland should get in touch with the State foresters and fire patrolmen and secure their cooperation and assistance in keeping down fire damage.

GRAZING AND INSECT DAMAGE.

Horses and cattle eat and break down young trees and pack the ground hard. Sheep and goats destroy large numbers of small

trees by eating them. Hogs root up the ground, digging up the young trees and roots and sometimes eating the roots. They also prevent young trees from starting by devouring the nuts and other seeds from which they grow. On the other hand, however, trees bearing small or unpalatable seeds often start well after hogs have rooted up the leaf litter and soil.

Some people fear that good pasture will be wasted by keeping stock out of the woods. This is hardly true, since a fully stocked woodland has little or no grass in it, for the reason that there is insufficient light. (Fig. 9.) Studies in farm management in northwestern Pennsylvania show that an open stand of trees, such as occur

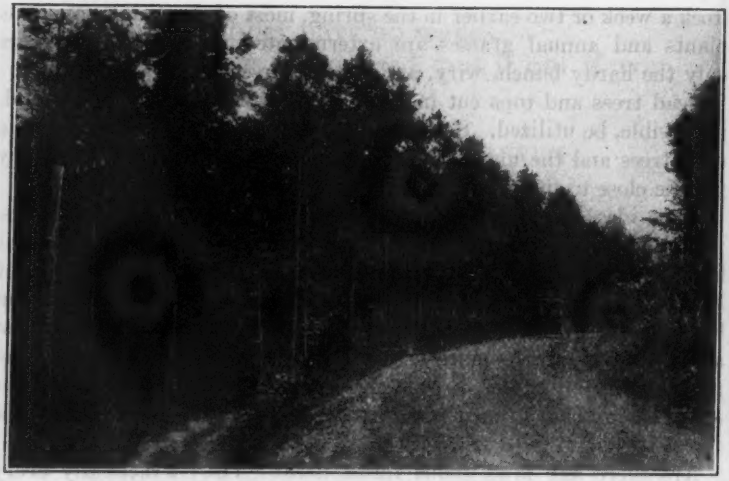

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FIG. 9.—Pine grows rapidly and every five years yields a crop by thinning.

in average wooded pastures, reduces the pasturage value of the land as much as 65 to 70 per cent.[1] Grass in the woods is a sign that the stand is in poor condition and the trees too far apart for growing a good quality and large amount of timber. This hardly applies in the southern longleaf pine region, where much good timber occurs in open stands. Grass grown under the shade of trees is much less nutritious than that grown in the open, so its actual food value is small.

Plenty of shade for live stock should be provided in pastures, but pasture land and woodland are most profitable when managed separately, each for the growing of its own individual product.

[1] Agriculture Bulletin 853, "The Organization and Management of Farms in Northwestern Pennsylvania."

Woodland may be guarded against serious insect damage and disease by removing dead or dying trees and all those showing signs of insect attack or decay. In the South, pine should be cut in the cool part of the year. When it is cut in summer, barkbeetles and wood-borers injure the cut trees, multiply rapidly, and spread to living trees, which they often kill by eating the rich inner bark for food. In cases of insect menace or injury it would be best to get into communication with the Bureau of Entomology, U. S. Department of Agriculture, or the State entomologist.

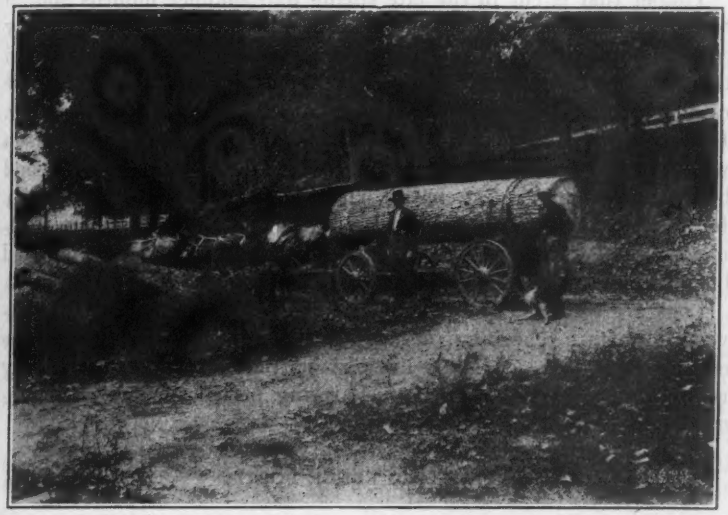


FIG. 10.—Because they split easily, clear white oak butt logs have been worked up into fence posts when several farmers could have jointly shipped a carload at fancy prices.

USING TIMBER AT HOME.

Lack of knowledge of the proper use of timber is one form of farm mismanagement.

It is a mistake to saw up choice logs of white oak, ash, cherry, and yellow poplar for rough uses at home, or to use clear black walnut for gate boards, or split up white-oak butts for fence posts. (Fig. 10.) Many valuable logs go into crossties, when they would bring the owner much more if sold as saw logs. Large numbers of young, rapid-growing trees, producing only one small tie, are cut, which, if left to grow for from three to five years, would more than double the profit.

Cutting is commonly done promiscuously without regard to continuing the future productiveness of the woodland, and large amounts of timber are commonly wasted in high stumps and long tops.

The importance of the home forest as a reserve for "pinch" times can not be overestimated. In the midst of the lumber shortage and high prices during the fall of 1919 and the spring of 1920, for example, communities and individual farms having local supplies of standing timber are reported to have suffered the least from the widespread deterioration of farm buildings and deferment of necessary new construction. The effect has been not only smaller losses of crops and live stock but better farm conditions and more contended farm labor.

Timber that is cut in the late spring and summer months should be handled with special care to avoid injury. This is because freshly cut wood is then more likely to be attacked by insects and fungi than during the cold part of the year. Seasoning also proceeds more rapidly during the warmer season and may cause excessive checking. If rightly handled, posts, poles, and logs may be cut at any season without their durability being affected. In no case should wood be allowed to lie in direct contact with the ground. The opportunity for insect attack and decay can be reduced to a minimum by peeling the timbers and open piling them off the ground in a shaded but dry place. This, however, does not retard checking of the wood.

Logs are sometimes stored under water in the hot season to prevent blue stain, checking, insect attack, and decay. Painting the ends of logs with a yellow ochre or barn paint will very materially retard injury by end checking. Painting peeled timbers with creosote will prevent sap stain and decay.

TREATING FENCE POSTS.

Every farm needs fence posts, but relatively few have sufficient supplies of lasting wood to meet home needs. This is particularly true in the Middle West and South. By means of a simple method of treating timber in open tanks with coal-tar creosote, the post and pole problem can be readily solved. By this process such short-lived woods as soft maple, beech, birch, sweet gum, black gum, young or sap pine, and red oak are made durable for use in the ground for 10 to 20 years.

A comparison of the annual costs of maintaining three fences built with posts of untreated sap pine, untreated white or post oak, treated white or post oak, and treated sap pine, respectively, indicates a saving of $8 to $23 per mile in favor of the treated pine. The following estimate is believed to be representative of the costs over a considerable part of the region where white oak or post oak and yellow pine occur:

Relative economy of treated and untreated fence posts.[1]

	Untreated sap pine.	Untreated white or post oak.	Creosoted sap pine.
Cost of post	$0.05	$0.21	$0.08
Cost of treatment			.25
Cost of setting	.15	.15	.15
Total cost of post in ground	.20	.36	.48
Average life of post in years	2	6	15
Average yearly cost	$0.10	$0.06	$0.03⅓
Average yearly cost of 1 mile of fence (posts 1 rod apart)	$32.00	$19.20	$10.24

[1] The costs of materials and labor, which were representive in 1922, should be regarded as showing relative rather than absolute values.

Although more expensive at the outset, creosoted posts are generally more economical to use than many kinds of untreated, short-lived woods, because of their much greater lasting qualities. The exceptions would be in remote localities with cheap wood and labor and where it would be expensive to obtain creosote. The large saving in the replacement charges, which ordinarily mount up so high in maintaining a fence, and the use of cheap and inferior kinds of wood in the first place, much more than offset the increased cost of thorough treatment with creosote. (Fig. 11.) Treated posts are a good investment and their use where lasting woods are scarce or expensive is a sign of sound judgment in farm management.

Cutting and seasoning.—It is important that the timber be peeled and thoroughly seasoned before an attempt is made to treat it. Small flakes of inner bark left on the wood prevent proper absorption of the preservative at those places. Peeling is done most easily during the spring months, but is carried on at other seasons of the year. The posts to be treated should be peeled from 3 to 4 months, depending upon the weather, before treatment, and open-piled in a dry situation to effect proper seasoning.

Kinds of posts.—Because they have a uniform absorbing surface of sap wood, round sticks are more satisfactory than split timber for treatment.

It is not profitable to treat lasting woods, such as red cedar, black locust, chestnut, and white oak. Practically all of the soft woods or sap woods may be treated and profitably used as posts.

Small-sized timber.—When treated timber is used it is not necessary to cut the large-sized line posts commonly employed untreated in the past. A post from 2 to 3 inches in top diameter, long enough to allow only a few inches above the top wire, costs less for creosoting and labor in handling, lasts as long as larger-sized timber, and possesses ample strength for ordinary fences. Small-sized trees are

abundant in second-growth timber, often being crowded out by more vigorous neighboring trees. Cutting these for fence posts utilizes

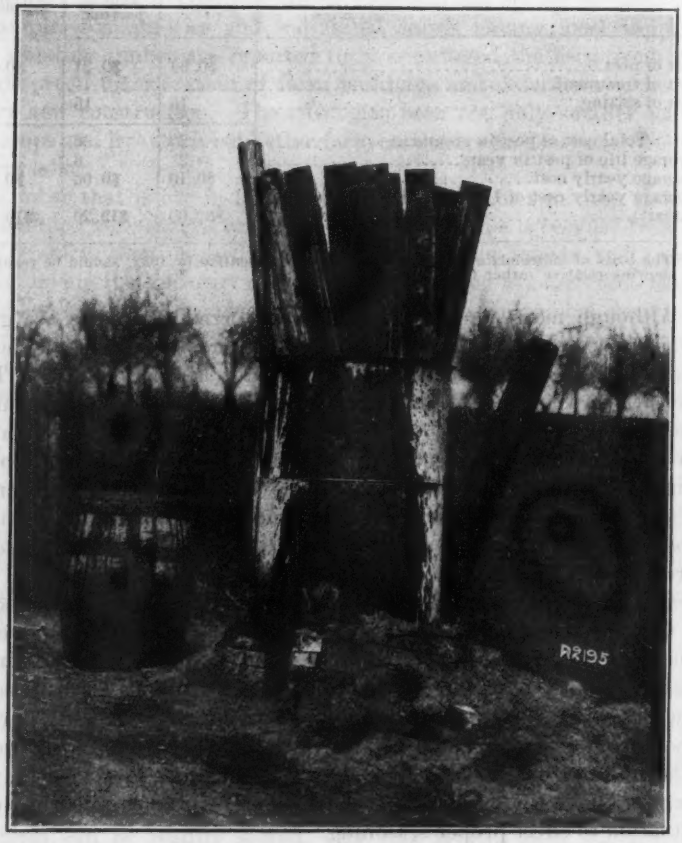


FIG. 11.—The treating of nondurable timber brings many kinds of wood into new forms of utilization. (Photo by courtesy of Iowa State College of Agriculture.)

the forest product that would often otherwise be wasted, improves the remaining stand, and furnishes profitable employment on the farm during slack time.

Kind of treatment.—Application of creosote by brushing over the whole post is only slightly effective in preventing decay, and rot often starts in small cracks which are not reached by the brush, or in checks which soon develop while the post is in use.

Open-tank treatment with a hot bath, followed by a cold bath is recommended for fence posts. The sapwood surrounding the heart-

wood takes treatment readily and is thereby protected against the entrance of decay.

Preservative.—It is important to use a good preservative, and coal-tar creosote has been found to be by far the most satisfactory material. Ordinary gas tar or coal tar has been used more or less, but it is usually too thick even when treated to give a fair degree of penetration.

Treating.—The best treatment is that which results in the deepest penetration into the wood with the least absorption of creosote. The butts of the posts should be placed for one to two hours in creosote heated to a temperature of 180° to 220° F. It is important to treat the wood to a height of a foot above the proposed ground line. In the southern States, the entire post should then be submerged into cold oil, 80° to 100° F., for one to two hours, or for such time as is necessary to get a good penetration. In the North where decay is less rapid, the cold treatment is applied usually to the butts only, the tops being treated by painting or dipping in creosote.

A satisfactory outfit for treating posts successfully consists of an upright cylindrical tank for the hot treatment, and a horizontal rectangular tank for the cold bath.

A saving in cost can be made by two or more farmers joining together in the purchase and use of treating tanks. This method in a number of instances has proved to be a successful form of cooperation.

PLANTING FOREST TREES.

The profitableness of forest planting can not be laid down by any rule, since it is subject to very wide variation. Rapid-growing kinds of trees of good, standard value can be grown profitably, however, on cheap lands located relatively near good markets. For example, as shown by actual demonstration on page 29, white pine yields very good returns in New England, and the same may be said of the yellow pines in various parts of the South. By good authorities it is held that white pine is the most profitable crop possible on large areas of New England. In the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, and Minnesota, the white pine blister rust is present, and planters of white pine should protect it from this disease by destroying all wild and cultivated currants and gooseberries within 900 feet of the plantation. These bushes are the alternate hosts of the blister rust and if permitted to remain near native or planted white pines in regions where the blister rust is prevalent, the trees become diseased and gradually die. Usually the cost of uprooting wild currant and gooseberry bushes is small.[1]

In rich agricultural belts the planting of forest trees on a large scale for direct money returns would undoubtedly prove to be

[1] For further information relative to protection from blister rust consult your State forester or the Bureau of Plant Industry, United States Department of Agriculture.

DENUDED HILLS
MEAN—
Floods.
Clogging of streams, lakes, and reservoirs.
Waste of soil.
Destruction of prosperous farms and other industries.
DEVASTATION.

a losing investment. Here, however, considerable forest planting goes on, but on relatively small, isolated tracts on farms and for special purposes, depending upon local conditions. Forest trees are planted chiefly to check soil erosion on slopes; to afford a windbreak as shelter for growing crops, live stock, and man; and to utilize to the best advantage rough, stony, or poor soils and inaccessible and wet lands.

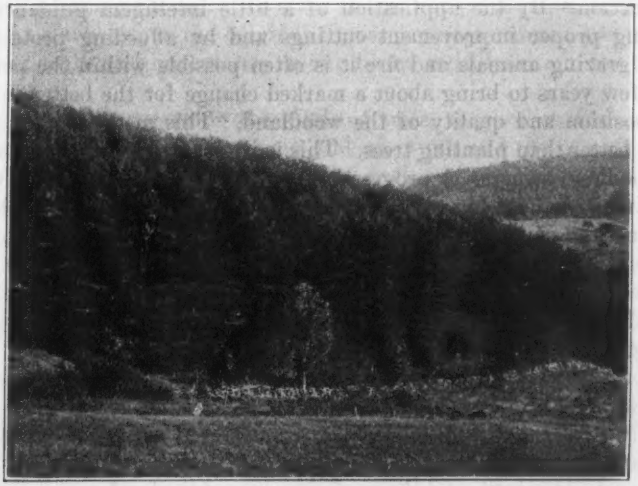
In western Tennessee, where the soil is a very deep, rich, clay loam, known locally as "brown loam," forest planting is being extensively pushed by the State as a means of reclaiming and making profitable badly eroding lands and at the same time checking at the source of the small streams the silting which results in expensive dredging operations on the Mississippi River and its navigable tributaries. Similar conditions prevail over large areas in other States of the Mississippi Basin and in the Piedmont section and lower slopes of the Appalachians.

On the farms of the eastern United States many thousands of acres of slopes have been cleared and become waste from which the forest should never have been removed. Careful cutting by the selection method would have resulted in keeping the land continuously productive. This mistake is still going on in some rural sections where foresight and study have not yet been generally applied to farm management.

FORESTED HILLS
Protect the soil.
Store up water.
Feed springs and streams.
Support prosperous farms and other industries.
PROTECTION.

PROFIT IN GROWING TIMBER.

AN EXAMPLE.



This white pine, which was planted on an abandoned sidehill pasture of about 3 acres in New Hampshire 44 years ago, now contains about 90,000 board feet of lumber. The total outlay at the time, counting the value of the land and labor of planting, was $35. The timber to-day is worth on the stump something over $1,500.

The farmer had this strip of practically worthless sidehill, and with some spare time on hand dug up 1,400 seedling pines growing in a thicket and set them out. About 20 years later the farmer died and among his assets was this small tract of young pine for which, much to her surprise, the widow was offered $300. The second owner retained it for about 15 years and then, wishing some money, sold it. Soon afterwards it came into the hands of the present owners, a lumber company, for something over $1,000.

Assuming a land value of $5 per acre, and a charge for taxes and oversight for the period averaging $2 per acre per year, the operation has yielded a return of 5 per cent on the total investment in land, labor, and annual outlay, and in addition a neat sum equivalent to a yearly net profit from the start of $2.34 per acre.

Forest-tree planting is practicable as a means of improving the quality of the woodland and increasing the quantity and value of its product. Through carelessness, cutting, fire, and other agencies many woodlands have fallen far below their maximum capacity of production. By the application of a little intelligent guidance in making proper improvement cuttings and by affording protection from grazing animals and fire it is often possible within the period of a few years to bring about a marked change for the better in the composition and quality of the woodland. This method often succeeds better than planting trees. This is illustrated by the experience of woodland owners. A progressive farmer in Summit County, Ohio, wishing to handle his woodlands rightly, excluded all live stock by fencing and at the same time planted catalpa in the larger openings in his woods. In 10 years the forest floor, instead of being bare and packed hard, consisted of a deep layer of spongy organic matter, affording protection to the roots of the trees. A complete understory of young yellow or tulip poplars, hard maple, beech, elm, white oak, hickory, and ash had sprung up. The volunteer poplars, it should be carefully noted, had grown to from 6 to 12 feet in height and completely overtopped and suppressed the planted catalpa. Since the poplars were the more valuable of the two species because of their rapid rate of growth and the useful quality of the lumber, nature had beaten the owner at his own game. By making proper thinnings, then, in 5 years the woodland was brought to the very satisfactory condition of having a good stand of valuable species of trees filling all the openings and coming on to take the place of the mature trees as cut.

In choosing species for planting it is always best to consider first the most desirable kinds of native trees, since they are already acclimated to the local conditions and are least subject to failure. In general, the various conifers, including the pines, are to be recommended for planting in most sections of the country because they are quick growing and yield softwood, which is in more demand than the hardwoods. Cottonwood, which holds the record for the fastest production of wood, is a good tree for relatively moist situations of good soil. Black locust takes root quickly on dry slopes and possesses to a marked degree the ability to hold the soil against agents of erosion. (Fig. 12.) It is somewhat limited in its range of successful growth by a locust boring beetle, which, however, can be controlled to a great extent by means of proper spacing and handling of plantations.[1] Black walnut is probably one of the best kinds of trees for the farm, owing to the high quality and value of its wood

[1] Refer to U. S. Department of Agriculture Bulletin 787, "Protection from the Locust Borer."

and its production of edible nuts. The more desirable trees for the farm to be favored in planting over a large region of the Eastern States include also the faster-growing red oaks, white oak, ash, hickory, and yellow poplar.[1]

The planting of forest trees for shade, nut production, and ornamental purposes, as the original timber becomes scarcer, has an increasing place of importance on our farms and likewise in the towns and cities.

Information regarding the kinds of trees, ways of obtaining seed or seedlings, methods of sowing and planting, and the care of trees can be had upon application to the various State foresters or the Forest Service, U. S. Department of Agriculture. Some of the

F-39292A

FIG. 12.—Black locust planted on waste land, supplying the farm with fence posts and enriching the soil.

State foresters, in addition to furnishing information, supply tree seedlings of the most desirable species at cost prices.

Next to the improvement of existing woodlands by proper handling and good methods of marketing the products, no branch of farm forestry is of greater importance than forest planting.

ADDITIONAL INFORMATION.

(1) Additional information on forestry may be secured by writing to the Forester, Forest Service, Washington, D. C. A list of available forestry publications can be obtained, including those bear-

[1] Much practical information on what to plant and how to plant forest trees is found in Farmers' Bulletin 1123, "Growing and Planting Hardwood Seedlings on the Farm."

ing directly on the subject of forestry for the farm. Some of the more important are:

Basket Willow Culture (Farmers' Bulletin 622).
Care and Improvement of Farm Woods (Farmers' Bulletin 1177).
Measuring and Marketing Farm Timber (Farmers' Bulletin 1210).
Cooperative Marketing of Woodland Products (Farmers' Bulletin 1100).
Preservative Treatment of Farm Timber (Farmers' Bulletin 744).
Waste Land and Wasted Land on Farms (Farmers' Bulletin 745).
The Windbreaks as a Farm Asset (Farmers' Bulletin 788).
Advice to Forest Planters in the Plains Region (Farmers' Bulletin 888).
The White Pine Blister Rust (Farmers' Bulletin 742).
Machinery for Cutting Firewood (Farmers' Bulletin 1023).
Making Woodlands Profitable in the Southern States (Farmers' Bulletin 1071).
Growing and Planting Hardwood Seedlings on the Farm (Farmers' Bulletin 1123).
Beautifying the Farmstead (Farmers' Bulletin 1087).
Street Trees (Agricultural Department Bulletin 816).
The Status and Value of Farm Woodlots in the Eastern United States (Agricultural Department Bulletin 481).
Use of Wood for Fuel (Agricultural Department Bulletin 743).
Small Sawmills (Agricultural Department Bulletin 718).
Protection from the Locust Borer (Agricultural Department Bulletin 787).
Protection of Forests from Fire (Forestry Bulletin 82); price, 15 cents.

(2) Circulars or bulletins on various phases of home forestry have been published by most of the State foresters. No attempt is made here to list these publications, but applications for information on forestry should be addressed to the various extension specialists in forestry connected with the State agricultural colleges, to the county agents, or to the State forestry departments, as follows:

State.	Official.	Address.
Alabama	State commissioner of conservation	Montgomery.
California	State forester	Sacramento.
Colorado	State forester	Fort Collins.
Connecticut	State forester	New Haven.
Idaho	State land commissioner	Boise.
Illinois	State forester	Urbana.
Indiana	State forester	Indianapolis.
Iowa	State forestry commissioner	Des Moines.
Kansas	State forester	Manhattan.
Kentucky	Commissioner of agriculture	Frankfort.
Louisiana	Superintendent of forestry	New Orleans.
Maine	Forest commissioner	Augusta.
Maryland	State forester	Baltimore.
Massachusetts	State forester	Boston.
Michigan	Director, department of conservation	Lansing.
Minnesota	State forester	St. Paul.
Montana	State forester	Helena.
New Hampshire	State forester	Concord.
New Jersey	State forester	Trenton.
New York	Superintendent, State forests	Albany.
North Carolina	State forester	Chapel Hill.
North Dakota	State forester	Bottineau.
Ohio	State forester	Wooster.
Oregon	State forester	Salem.
Pennsylvania	Commissioner of forestry	Harrisburg.
Rhode Island	Commissioner of forestry	Chepachet.
South Dakota	Forest supervisor	Custer.
Tennessee	State forester	Nashville.
Texas	State forester	College Station.
Vermont	Chief forester	Montpelier.
Virginia	State forester	University.
Washington	State supervisor of forestry	Olympia.
West Virginia	Chief game protector	Charleston.
Wisconsin	Conservation commissioner	Madison.

(3) Sets of about 50 colored lantern slides, each accompanied by a syllabus, or lecture, will be loaned to schools and other educational agencies by the Forest Service for short periods on condition that borrowers agree to pay transportation charges, to be responsible for slides lost or broken, and to forward the slides promptly and in good condition upon request. Application should be made as far in advance of the need as possible, since the sets are usually engaged for a considerable time in advance. The subjects upon which sets are available are:

Forestry in Agriculture.
Farm Forestry in the South.
Tree Windbreaks.
Street Trees.
Farm Woodlands.
Nature Study and Forestry.
Botany and Forestry.
Farm Forestry in the Northeast.
Manual Training and Forestry.
Geography and Forestry.
Life of a Tree.
Conservation of the Forest.
Forestry in the United States.
The Work of the Forest Service.
Recreation on National Forests.

Application should be made to the Forester, Forest Service, Washington, D. C., for the loan of any of the above sets of lantern slides.

F-18113

FIG. 13.—Forest trees needed to check soil erosion and make land bring an income.

WOODLANDS on farms in the eastern half of the United States would form a strip 100 miles in width reaching from New York to San Francisco.

Farmers own as much forest land as do all the lumbermen and other private holders together.

Farms contain more than one-half the entire hardwood forest area of the United States.

Woods occupy a larger part of the farms of this country than does any other crop; in fact as much as all the cereal crops combined.

The haphazard cutting of trees with no plan or thought for the future invariably results in the deterioration of the woods, both in quality and value. Often the rapid-growing, straight trees are cut because they can easily be worked up, and yet these are the very ones that should be left to develop into high-grade timber.

Using good pasture land to support scrub stock and devoting woodland to the growing of inferior trees are both examples of mismanagement on the farm.

Many woodlots on farms consist of park-like stands of defective trees having little commercial value. The forest should be so dense that little grass can grow. If stock need additional shade some woodland may be included in the pasture. The attempt to combine stock grazing with timber growing in farm woods is neither good grazing practice nor profitable forestry.

A forest without young growth is like a community of old people; it will die out.

Timber is a national necessity; the supply of it is being rapidly depleted. By growing more timber, the farmer increases his own income and benefits the public.

On the poorer lands of many farms in the United States white pine, ash, oak, hickory, poplar, black walnut, cottonwood, black locust, shortleaf pine, or slash pine is the best-paying crop.

On remote farms, where buyers formerly would make no offer on less than a carload of timber, good roads and the motor truck have made it possible for the farmer to sell individual trees at fair prices.

The total value of the timber product from farm woodlands in 1919 (1920 census) increased to about double that of 1910, or to about $394,000,000.

FORESTRY INCREASES FARM INCOME BY

1. Making waste lands yield a profit by growing timber on
   - Poor soils
   - Steep slopes
   - Rocky lands
   - Wet lands
   - Unused corners
   - Eroded lands.
2. Furnishing paying employment for men and teams during the winter.
3. Utilizing timber better on the farm and avoiding waste by
   - Cutting low stumps and small tops,
   - Using substitute woods in construction,
   - Treating nonlasting woods.
4. Increasing crop yields by planting forest tree windbreaks.
5. Growing more and better timber on the farm through
   - Protecting the woods from fire and overgrazing,
   - Selecting for cutting the mature, defective, overcrowded, and inferior kinds of trees, and leaving the straight, thrifty, and better kinds,
   - Planting to fill openings in woods.
6. Marketing the higher grades of wood products direct to consumers at fair prices as
   - Saw logs
   - Poles
   - Piling
   - Cooperage bolts
   - Handle bolts
   - Posts
   - Pulpwood
   - Firewood
   - Spoke blocks
   - Tannin bark.

MAKE YOUR WOODLAND PERMANENTLY PROFITABLE.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE.

February 12, 1924.

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This bulletin is a contribution from

Forest Service	W. B. GREELEY, *Chief.*
Branch of Forest Management	E. E. CARTER, *in Charge.*

WASHINGTON : GOVERNMENT PRINTING OFFICE : 192

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U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1117

rev July 1925

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FORESTRY AND FARM INCOME

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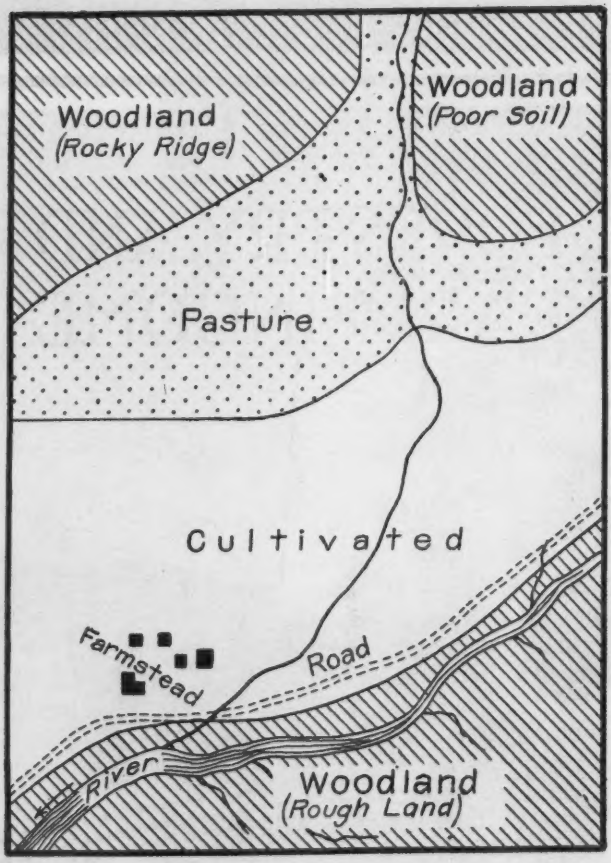
U. S. Department of Agriculture

NO IDLE LAND ON THE FARM.



Woodland on the hills, pasture land on the slopes, and cultivated land below.

Washington, D. C.

Issued August, 1920
Revised July, 1928

FORESTRY AND FARM INCOME.

By WILBUR R. MATTOON, *Extension Forester, Branch of Public Relations, Forest Service.*

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WHY FARM FORESTRY PAYS.

THE right handling of forest trees on the farm will make it more prosperous, add to its comforts as a home, and enhance its value as an investment.

The home forest, in many sections of the country, will supply the timber which the farm needs for buildings, fences, fuel, repairs of all kinds, and many other uses; and there will often be a surplus which can be sold in the form of standing timber, saw logs, posts, poles, crossties, pulpwood, fuelwood, and blocks or billets for making spokes, handles, spools, boxes, barrels, and excelsior.

A well-cared-for home forest serves also as a windbreak for buildings, a shelter for live stock, a protection of valuable lands from erosion, a means of profitable employment for men and teams during otherwise spare or idle time, a place of recreation, and an improvement in the appearance of the farm.

Trees improve and build up the soil. The leaves, small twigs, and other tree litter decompose and form a layer of dark-colored vegetable mold, which enriches the soil and stores up soil moisture. By means of this layer of mold, the binding of the soil by the roots of the trees, and the resistance of the trunks to the rapid flow of water, the woods prevent floods from gullying or destroying the land by erosion, particularly on steep slopes.

Even if a farmer sells no timber the woodland pays. The firewood, fence posts, and material for repair and construction on the farm, the time and money saved by having them conveniently on hand, and the protection against extremes of weather afforded the crops, farm buildings, and stock are worth considerably more than the slight trouble and expense of raising and caring for the trees.

The woods need not occupy good farm land that will grow other crops. Trees should, as a rule, be located on land too poor to cultivate, such as gullied or very rocky land, swamps, steep slopes, and barren soils. Unused corners and small uncultivated spots about the farm are good places for rapid-growing, useful trees. The chief economic reason for timber growing on the farm is to get a profit from those portions which would otherwise be unproductive.

Though the land on which the farm forest is situated may not be suitable for other crops, it should not be treated as waste land. (Fig. 1.) By a little care it can be made to produce valuable timber. Only a little attention is required, and this may be given in the winter or when other farm work is slack. Forest trees and woodland are

F-22106A

FIG. 1.—Timber for the farm and for market, and shelter for the farmstead from woodland covering a stony ridge.

more valuable now than they were a few years ago. Many trees that used to have little value, and even small trees that used to be counted as brush to be got rid of, are now in good demand.

A permanent woodland is an essential part of a well-equipped farm; and more than ever before farm woodland has become a valuable asset convertible into money.

EXTENT OF FARM WOODLANDS.

About one-third of all the forest land of the United States is on farms. According to the latest available figures (1920 census) this means that the farm woodlands amounted in all to about 168,000,000 acres. This is equivalent, roughly, to the aggregate area of Pennsylvania, Virginia, Ohio, Indiana, Illinois, Kentucky, and Tennessee.

If placed contiguous it would form a solid strip 100 miles in width reaching from New York to San Francisco. In the eastern United States—east of the Plains—the total woodlands on farms amounted to about 150,000,000 acres. (Fig. 2.) Farm woodlands in the eastern United States comprise an area nearly seven times as large as the entire forest lands of France, which furnished practically all the

FIG. 2.—Important farm woodland regions.

timber required during the war by the armies of France, Great Britain, Belgium, and the United States.

Assuming that every farm in the eastern United States has some woodland, there is an average of about 26 acres per farm. The amount of woodland on farms varies widely, however, in the different sections of the country. The important woodland region of the East-

ern United States is shown with its subdivisions in Figure 2. The average area of woodland per farm, the average proportion of the farm that is wooded, and the total woodland in the United States are shown in the following table:

States (by groups).	Average area of woodland per farm.	Proportion of farm land wooded.	Total area of farm woodland.
	Acres.	*Per cent.*	*Acres.*
New England (Me., N. H., Vt., Mass., R. I., Conn.)	44.8	41.3	7,020,311
Middle Atlantic (N. Y., N. J., Pa.)	20.4	21.3	8,659,237
South Atlantic (Del., Md., D. C., Va., W. Va., N. C., S. C., Ga., Fla.)	36.1	42.8	41,802,203
Lake (Mich., Wis., Minn.)	23.2	18.3	13,101,556
North Central (Ohio, Ind., Ill., Iowa, Mo.)	17.3	14.0	20,291,681
South Central (Ky., Tenn., Ala., Miss., Ark., La., Okla., Tex.)	28.4	23.0	58,163,676
Plains (N. Dak., S. Dak., Nebr., Kans.)	7.8	2.2	3,430,045
Mountain (Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.)	28.2	5.9	6,887,071
Pacific (Wash., Oreg., Calif.)	35.8	14.9	8,374,944
Average per farm and total	26.0	17.5	167,730,784

VALUE OF WOODLAND PRODUCTS.

Considerable income may be derived from the home forest. The total value of forest products taken from timbered land on farms reported in the 1920 census was $394,321,828. Nearly half of this represents the value of wood and various minor wood products used on the farm and the rest the value of the products sold or cut and

TIMBER RAISING IN EASTERN UNITED STATES PAYS BECAUSE—

1. There is plenty of cheap land unfit for agriculture.
2. The abundant rainfall permits rapid tree growth.
3. Transportation facilities by rail and water are good.
4. Numerous large cities furnish an adequate market.
5. The region is far removed from the virgin supplies of the Pacific Northwest.

held for sale. For the farms reporting, this amounts to an average of about $217 per farm. Nineteen States reported over $10,000,000 each in forest products from their farms; and four—Virginia, North Carolina, Georgia, and Tennessee—reported more than $20,000,000 each.[1]

Firewood is one of the important crops of the farm. In 1920 an average of 10.6 cords of wood, or a total of 68,244,000 cords, were burned on the farms of the country. Piled continuously, this would reach four times around the world. The total production of cordwood during the year, which includes wood burned on farms and that sold by farmers to city dwellers, is estimated at not less than 90,000,000 cords. The average farm value in 1920 was $5.07 a cord. The figures show that farmers in the Southern States are the heaviest fuel-wood users. North Carolina and Tennessee lead with an average of 17 cords used on each farm during the year. The farms of Vermont, Virginia, and Arkansas averaged 15 cords; Kentucky, 14 cords; Michigan, Georgia, and Alabama, 13 cords; Maine, New Hampshire, Connecticut, Wisconsin, South Carolina, and Missouri, 12 cords.

SECURING GOOD FOREST GROWTH.

At present farm woodlands are yielding, as a rule, only from one-third to one-half the wood they could grow. This is because only a few farmers realize the possibilities in their woodlands and give them proper care. As a result the home forest, which is close at

$1 A DAY PROFIT.

A NEW YORK FARMER'S WOODLAND OF 115 ACRES EARNS HIM A CONTINUOUS PROFIT OF $1 A DAY.

The annual growth is 0.65 cord per acre.
115×0.65=75 cords (mostly poplar).
He cuts an annual crop of 75 cords.
His profit is $4.86 per cord.
75×$4.86=$364.50.

[1] More than three-quarters of the present total timber supply of the United States is on privately owned lands. Much has been said about the supply of timber on the National Forests as a means of meeting the decreasing amounts of privately owned timber. The fact is, however, that they contain somewhat less than one-quarter of the country's timber, and the timber now being cut from them (1925) represents only about 3 per cent of the entire consumption. The rest comes from private lands.

hand, where a little attention each year in protecting, cutting, and utilizing the timber would be very profitable, is in poor condition.

The amount of timber that an acre can grow in a year varies a good deal with the quality of the soil and moisture supply and the kind and number of the trees per acre. If fully stocked with trees and well cared for, an acre of hardwoods should grow yearly from about one-half to 1 cord of wood and of pine from 1 to 2 cords, a cord being equivalent to about 500 board feet of saw timber. Growth averages rather less in the northern part of the country because of the shorter season and somewhat more in the warmer southern part.

The chief essentials in keeping the trees growing are excluding fires and allowing the humus to collect on the forest floor. Large openings in the woods reduce the annual yield of timber and should not be allowed to occur. The length of time required to reach merchantable size varies with the kind of tree and the use to which its wood is to be put. Posts and crossties may be grown in from 10 to 30 years, and most kinds of quick-growing trees will be large enough for saw timber in from 20 to 40 years.

After logging, a new stand of young trees generally starts naturally from seeds or sprouts from stumps. The natural seeding process in the woods can be helped by harrowing the ground or, before the seed falls, turning hogs into the woodland, both of which enable the seed to get in contact with the mineral soil, or by conducting logging operations in a good seed year before the seed falls, so that it germinates quickly.

A WHITE PINE STAND IN NEW HAMPSHIRE GROWS 1,000 BOARD FEET A YEAR.

Two acres of white pine, near Keene, N. H., were sold several years ago, before the war prices, for $2,000 on the stump. The total stand was 254 cords, which equals 170,000 board feet, or an average of 85,000 feet per acre. The trees were from 80 to 85 years old; so the growth on each acre was about 1,000 feet per annum and the gross returns about $12.20 per acre per annum.

Some points to be remembered about trees which sprout are: (1) The most thrifty sprouts come from clean, well-cut stumps felled during the late fall, winter, or very early spring before the sap begins to flow; and (2) the top of the stump should be cut slanting, so as to shed water. Trees which sprout successfully include such

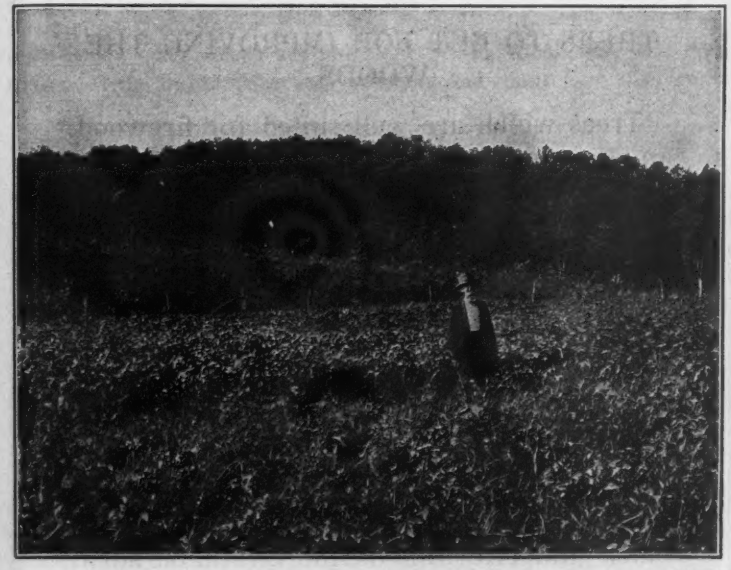

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FIG. 3.—Thrifty woods, good crops, and a happy farmer.

hardwoods as the oaks, hickories, chestnut, basswood, gums, cottonwood, and willows, and young short-leaf and pitch pines.

Woodlands may also be restocked with young trees by sowing seed or planting out small seedlings grown in nursery beds or dug up in the woods. If trees are to be planted, it is well to select those native to the region which grow most rapidly and produce the most useful kinds of wood.

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TREES TO CUT FOR IMPROVING THE WOODS.

Trees which are well suited for firewood, and the removal of which will be an improvement to the remaining trees in the stand.

Trees which have been overtopped by others and have had their growth stunted.

Diseased trees, or trees seriously injured by insect attacks, or trees extremely liable to such injury; for example, chestnut in the region subject to blight or birch in the gipsy-moth area.

Badly fire-scarred trees.

Trees of the less valuable species, such as beech, birch, black oak, black jack oak, or black gum, crowding the more valuable sugar maple, white or shortleaf pines, yellow poplar, or white oak.

Crooked trees and large-crowned, short-boled trees which will not make good lumber and which are crowding or overtopping others.

Slow-growing trees crowding fast-growing species of equal value.

Sound dead trees, both standing and down.

IMPROVING THE WOODS BY CUTTING.

Cutting should be done so as to cause the least possible waste or damage to other living trees, particularly young trees. In felling trees, advantage should be taken of natural openings in the woods.

Good management should result in a home forest fully stocked with sound, well-shaped trees of valuable and useful kinds that are growing as fast as possible. This can be brought about largely by cutting out the inferior kinds—the "weed" trees—for exactly the same reason that weeds are hoed out of the cornfield. The good trees need the light, space, soil moisture, and plant food that would

F-4108

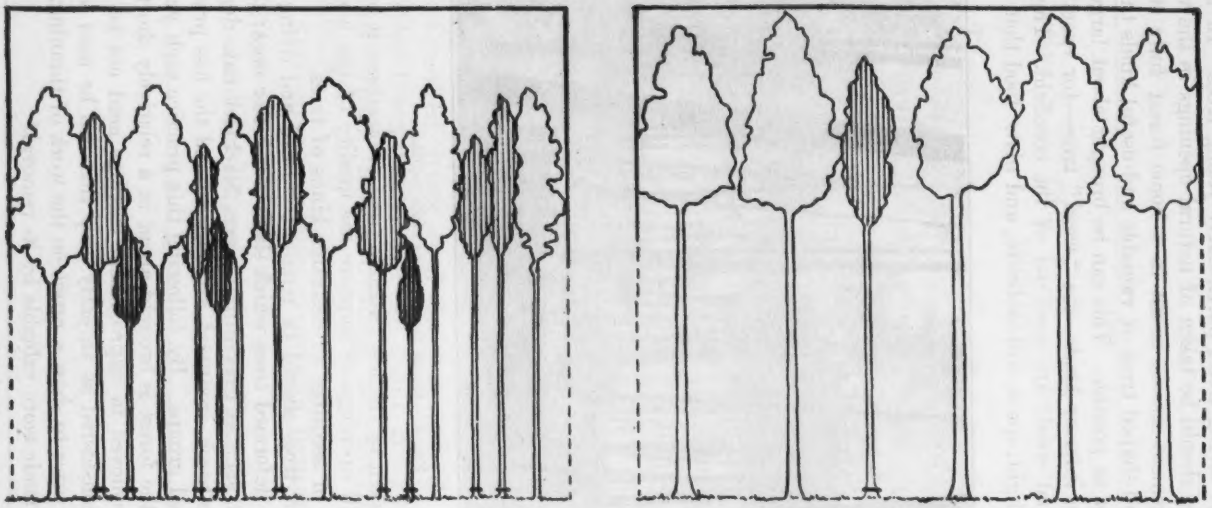
FIG. 4.—Woods improved by right cutting.

otherwise be taken by the less valuable trees. Sometimes it becomes advisable to fill openings or improve the quality of the woods by planting seeds or seedlings of desirable kinds of trees.

What sort of trees should be removed? Dead and dying trees; diseased trees; deformed trees which shade out better ones; the less valuable kinds, such as gray birch, aspen, blackjack oak, dogwood, sourwood, blue beech, ironwood, and others; and the less promising trees in crowded groups. By following this practice each year improvement in the forest is brought about in a relatively short time.

The wood removed in improvement cuttings need not be a loss. It should be considered as an early crop that can be used or sold, generally at a price to show a profit on the work of thinning, while the woods are made more valuable by its removal.[1]

[1] See Farmers' Bulletin 1177, "The Care and Improvement of Farm Woods."



A. B.

FIG. 6.—The growth and value of pine are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber. (A) Before thinning—15 overcrowded trees. (Shaded trees to be cut.) (B) The same stand 5 years later after thinning—6 larger and more valuable trees. (Shaded tree to be cut).

ESTIMATING AND SELLING TIMBER.

When timber is no longer growing at a profitable rate it should be cut and used or sold. A farmer who is ready to sell timber would profit by measuring his trees, estimating how much saw timber or

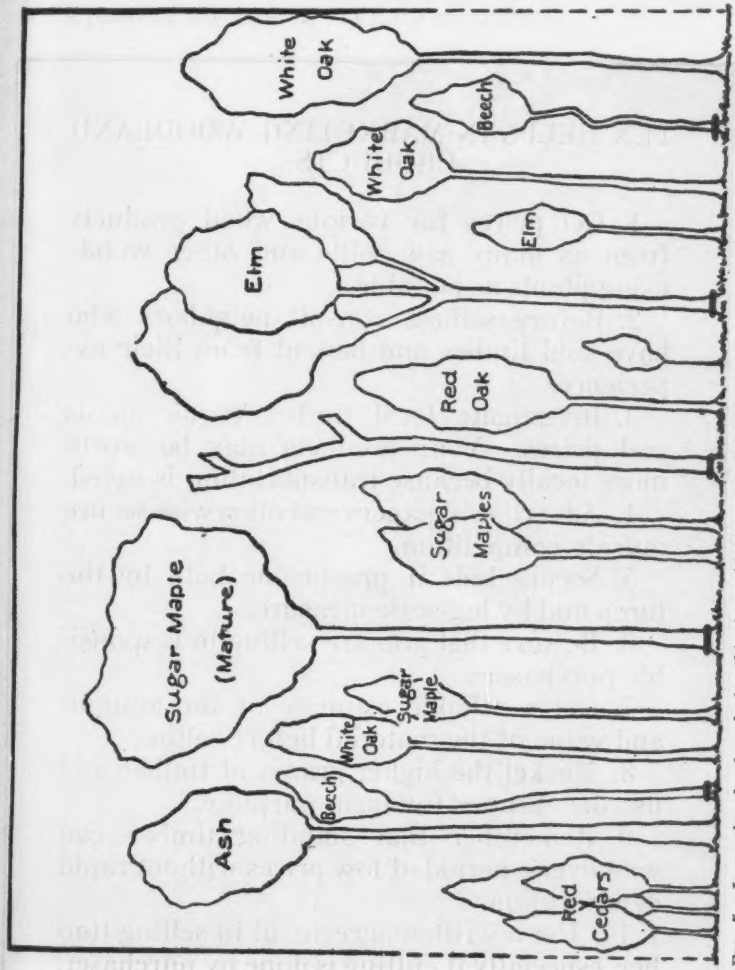


FIG. 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species to be cut. A good stand left of thrifty middle-aged and promising young trees.

other products they contain, and making inquiry to find out how much they are worth. If he does not know or can not find out how to do this, he should employ some experienced and reliable person to estimate and value his timber for him.

The customary units of measure in selling farm timber are board feet, cords, linear feet, and the piece. A board foot, for example, is 12 inches long, 12 inches wide, and 1 inch thick, or its equivalent.

TEN HELPS IN MARKETING WOODLAND PRODUCTS.

1. Get prices for various wood products from as many saw mills and other wood-using plants as possible.
2. Before selling, consult neighbors who have sold timber and benefit from their experiences.
3. Investigate local timber requirements and prices. Your products may be worth more locally because transportation is saved.
4. Advertise in papers and otherwise secure outside competition.
5. Secure bids if practicable both by the lump and by log-scale measure.
6. Be sure that you are selling to responsible purchasers.
7. Get a reliable estimate of the amount and value of the material before selling.
8. Market the higher grades of timber and use the cheaper for farm purposes.
9. Remember that standing timber can wait over a period of low prices without rapid deterioration.
10. Use a written agreement in selling timber, especially if cutting is done by purchaser.

The standard cord of wood is 4 feet high, 4 feet wide, and 8 feet long. The linear foot is a measure of length only, without regard to the other dimensions of the material. Piece measure is only a count of the pieces in any form in which the wood is sold.

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FIG. 7.—Fast-growing hickory is one of the most marketable forest trees. It is in strong demand for spokes and implement handles.

Logs and standing trees are usually estimated in board feet. Saw timber is measured in board feet. Round timber, such as poles and piling, is usually sold by the linear foot. Firewood, pulpwood, and wood for distillation and other uses cut in short lengths are usually sold by the cord. Fence posts, ties, telephone poles, and some other forms of timber are sold by the piece.

FARM WOODLAND IN THE NORTH.

Farm woodlands amount to two-fifths of all forested lands.

There are about 53,000,000 acres of farm woodland.

In New England more than 65 per cent of all forested land is on farms, and in Ohio, Indiana, Illinois, and Iowa from 80 to 100 per cent.

The income to farms from timber products is estimated at about $198,000,000 yearly.

Saw timber in the standing tree is estimated by measuring the diameter of the tree, outside the bark, at breast height (4½ feet above the ground), and measuring or estimating the height of the tree. When these measurements are known the contents of the tree can be found from a volume table.[1] Often the length of the part of the trunk to be used is taken in units, or number of 16-foot logs, instead of the total height of the tree.

A volume table is one showing in board feet the amount of timber that can be sawed from trees of given heights and diameters or from a given number of merchantable logs and diameters. For example, a volume table for white oak would show that a tree 18 inches in diameter (measured outside the bark at breast height) and having three merchantable 16-foot logs will saw out 286 board feet of lumber Volume tables are made for different kinds of trees, each table based on the average of many measures of felled trees.

A saw log is measured by taking the length of the log and its diameter inside the bark at the small end, then employing a log rule to estimate the amount or number of board feet it contains. A log rule is a statement of the estimated number of board feet of lumber that can be sawed from logs of different lengths and sizes. A good rule for 12-foot logs is to multiply the diameter inside bark at the small end by half the diameter. For shorter logs the contents will be proportional to the length of the logs. Thus, a 12-foot log 16 inches in diameter will saw out about 16×8 or 128 board feet, while a 10-foot log 14 inches in diameter will cut $\frac{10}{12}$ of 14×7, or 81⅔

[1] For volume tables and other information on estimating and measuring timber, see Farmers' Bulletin 1210 or apply to State foresters.

FARM WOODLAND IN THE SOUTH.

Woodlands on farms comprise one-half of all the forested lands.

There are more than 100,000,000 acres of farm woodland.

In Maryland, Virginia, North Carolina, Kentucky, and Oklahoma, more than 60 per cent of all forest land is on farms.

The present yearly farm income from woodlands is estimated at about $190,000,000.

board feet. The Doyle rule is probably most commonly used in this country. To determine the number of board feet in a log by this rule deduct 4 inches from the diameter of the small end, then square one-fourth the remainder and multiply the product by the length in feet. For example, a log measuring 20 inches at the small end and 12 feet long contains 192 feet. This is not an accurate rule for small-sized timber, since it shows one-half to one-fourth fewer board feet in logs from 6 to 20 inches in diameter than are actually sawed out in the mill. For logs larger than 20 inches it is fairly accurate. In buying and selling operations the value placed on small logs is sometimes made to take into account the small scale on the basis of the Doyle rule, but more often the seller is the loser.

FARM FORESTRY MAKES FARMING PAY BETTER BY—

1. Marketing timber profitably.
2. Supplying timber for farm needs.
3. Furnishing employment for men and teams in winter.
4. Making waste lands yield a profit.
5. Increasing the sale value of the farm.

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For handy reference the Champlain and Doyle log scales are given (Tables 1 and 2) for logs measuring from 6 to 25 inches in diameter. The former scale shows approximately the amount of lumber that can be sawed out in small mills using circular saws, cutting ¼-inch saw kerf but operated carefully without unnecessary waste and otherwise closely utilizing the timber.

TABLE 1.—*Champlain Log Scale.*[1]

Diameter of log (between bark at small end).	Length of log, in feet.								
	8	9	10	11	12	13	14	15	16
	Contents of log, in board feet.								
Inches.									
6	11	12	14	15	17	18	19	21	22
7	16	18	20	22	24	26	28	30	32
8	21	24	27	30	32	35	38	40	43
9	28	31	35	38	42	45	49	52	56
10	35	40	44	48	53	57	62	66	70
11	43	49	54	60	65	70	76	81	87
12	52	59	65	72	78	85	92	98	105
13	62	70	78	85	93	101	109	116	124
14	73	82	91	100	109	118	127	136	146
15	84	95	105	116	126	137	147	158	168
16	97	109	121	133	145	157	169	181	193
17	110	123	137	151	165	178	192	206	219
18	124	139	155	170	186	201	217	232	247
19	139	156	173	190	208	225	242	260	277
20	154	173	193	212	231	251	270	289	308
21	171	192	213	235	256	277	299	320	341
22	188	212	235	259	282	306	329	353	376
23	206	232	258	284	309	335	361	387	412
24	225	253	282	310	338	366	394	422	450
25	245	276	306	337	368	398	429	460	490

TABLE 2.—*Doyle Log Scale.*[2]

Diameter of log (between bark at small end).	Length of log, in feet.					
	6	8	10	12	14	16
	Contents of log, in board feet.					
Inches.						
6	1.5	2	2.5	3	3.5	4
7	3.4	4.5	5.6	6.8	7.9	9
8	6	8	10	12	14	16
9	9	12	16	19	22	25
10	13	18	22	27	31	36
11	18	24	31	37	43	49
12	24	32	40	48	56	64
13	30	40	51	61	71	81
14	37	50	62	75	87	100
15	45	60	76	91	106	121
16	54	72	90	108	126	144
17	63	84	106	127	148	169
18	73	98	122	147	171	196
19	84	112	141	169	197	225
20	96	128	160	192	224	256
21	108	144	181	217	253	289
22	121	162	202	243	283	324
23	135	180	226	271	316	361
24	150	200	250	300	350	400
25	165	220	276	331	386	441

[1] The Champlain rule shows approximately the amount of lumber cut from logs by close sawing. The full table includes logs up to 60 inches in diameter.

[2] The Doyle rule was originated at the time of abundant and cheap timber. It gives a much smaller scale for small-sized logs than is actually sawed out according to present custom. The full table runs to and includes logs 40 inches in diameter.

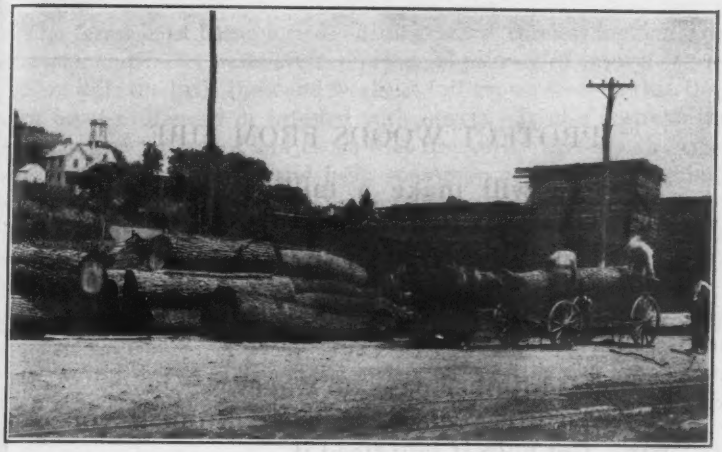

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FIG. 8.—Choice logs bring high prices and are often shipped long distances.

In finding a buyer for his timber the owner should inquire of his neighbors who have sold, or at local sawmills, wood yards, wood-using factories, railroad stations, and telegraph and telephone companies. He should also advertise in the papers and write personal letters furnishing a brief description of the kind, quality, and amount of timber for sale, in order to awaken competition among local and outside buyers. Securing a number of bids for the same piece of timber will tend to develop the best market and increase returns. It is well to have a written agreement as to the manner in which the timber shall be cut, the amount and form of payment.[1]

Some of the industries buy their supplies largely or wholly in the log; hence, in many cases it will pay the farmer to look up these special markets for his logs, bolts, poles, ties, etc. Industries buying their supplies more or less generally in the form of round timber are manufacturers of handles, cooperage, veneer, woodenware and novelties, shuttles, bobbins and spools, vehicle stock, athletic goods, and pulpwood. Poles are purchased by electric lighting, power, and telephone companies. Markets for piling will be found by applying to railroads, wharf, bridge, and bulkhead contractors in the larger towns and cities. For prices on ties, consult the nearest local railroad station agent. Cordwood is used by brickmakers, bakeries, limekiln operators, and fuel dealers in towns.

[1] A sample contract and a good many helpful points on measuring and selling farm forest products may be found in Farmers' Bulletin 715, "Measuring and Marketing Farm Timber," and Farmers' Bulletin 1100, "Cooperative Marketing of Woodland Products."

PROTECT WOODS FROM FIRE.

A tree will make a million matches—a match may destroy a million trees.

Take no chances with lighted matches, tobacco, brush or camp fires.

Forest destruction is quick—forest growth slow.

Burned timber pays no wages.

When fire is discovered, put it out if you can. Get help if you need it.

ARE YOU PRACTICING PREVENTION AND FOREST PROTECTION?

HELP PREVENT WOODS FIRES.

BE SURE your match is out before throwing it away.

DON'T throw away burning tobacco.

CHOOSE a safe place and make your camp fire small.

PUT OUT your fire with water and then cover it with earth.

DON'T make large brush heaps. Choose a still day for burning, and plow furrows to protect near-by woods.

BE CAREFUL WITH FIRE.

FIRE PROTECTION.

The forest must be protected. Fire, grazing, careless logging, tree diseases, and insect pests are the principal sources of injury.

Fire kills the little trees and weakens full-grown trees so that they may become diseased or infested with insects. It also destroys the humus cover of leaves and twigs that ordinarily protects the trees against summer drought and heat, conserves water for the springs and streams, and enriches the soil by adding nitrogen. The loss of this natural fertilizer by burning amounts to a very large sum, entirely sufficient to warrant complete fire protection of the country's forests.

Burning over the ground with the aim of improving grazing is an expensive mistake. Although it is possible to secure green grass for stock a week or two earlier in the spring, most of the rich leguminous plants and annual grasses are exterminated, leaving as survivors only the hardy bunch, wiry, and other coarse perennial grasses.

Dead trees and tops cut in logging are a fire menace and should, if possible, be utilized. Sawlogs or firewood can be made out of the dead trees and the unused large tops should be lopped so that they will lie close to the ground and rot quickly.

Some idea of the prevalence of fires in the eastern United States, including the Mississippi Basin, may be formed from the fact that here occur 80 out of every 100 forest fires. For the five years of 1916 to 1920, inclusive, an average of 24,600 fires yearly in this region burned over 10,000,000 acres of land and caused a property loss amounting yearly to more than $14,400,000. While fires were reported from all States, a greater number of fires and larger losses occurred in the southern pine district than in any other important forest region.

Are there any laws about forest fires? Yes. Practically every State has strict laws against the setting of fire and carelessness in the burning of brush. In a number of States the railroads are required to use efficient spark arresters in their locomotives and burn fire lines along their rights of way.

Forest fire protective systems have been established by a number of States. Patrolmen are employed who travel the regions where there is danger of forest fires, watch for fire, and educate the public in the need for care in preventing fire and for getting quickly to any fire that may occur. Owners of woodland should get in touch with the State foresters and fire patrolmen and secure their cooperation and assistance in keeping down fire damage.

GRAZING AND INSECT DAMAGE.

Horses and cattle eat and break down young trees and pack the ground hard. Sheep and goats destroy large numbers of small

trees by eating them. Hogs root up the ground, digging up the young trees and roots and sometimes eating the roots. They also prevent young trees from starting by devouring the nuts and other seeds from which they grow. On the other hand, however, trees bearing small or unpalatable seeds often start well after hogs have rooted up the leaf litter and soil.

Some people fear that good pasture will be wasted by keeping stock out of the woods. This is hardly true, since a fully stocked woodland has little or no grass in it, for the reason that there is insufficient light. (Fig. 9.) Studies in farm management in northwestern Pennsylvania show that an open stand of trees, such as occur

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FIG. 9.—Pine grows rapidly and every five years yields a crop by thinning.

in average wooded pastures, reduces the pasturage value of the land as much as 65 to 70 per cent.[1] Grass in the woods is a sign that the stand is in poor condition and the trees too far apart for growing a good quality and large amount of timber. This hardly applies in the southern longleaf pine region, where much good timber occurs in open stands. Grass grown under the shade of trees is much less nutritious than that grown in the open, so its actual food value is small.

Plenty of shade for live stock should be provided in pastures, but pasture land and woodland are most profitable when managed separately, each for the growing of its own individual product.

[1] Agriculture Bulletin 853, "The Organization and Management of Farms in Northwestern Pennsylvania."

Woodland may be guarded against serious insect damage and disease by removing dead or dying trees and all those showing signs of insect attack or decay. In the South, pine should be cut in the cool part of the year. When it is cut in summer, barkbeetles and wood-borers injure the cut trees, multiply rapidly, and spread to living trees, which they often kill by eating the rich inner bark for food. In cases of insect menace or injury it would be best to get into communication with the Bureau of Entomology, U. S. Department of Agriculture, or the State entomologist.

FIG. 10.—Because they split easily, clear white oak butt logs have been worked up into fence posts when several farmers could have jointly shipped a carload at fancy prices.

USING TIMBER AT HOME.

Lack of knowledge of the proper use of timber is one form of farm mismanagement.

It is a mistake to saw up choice logs of white oak, ash, cherry, and yellow poplar for rough uses at home, or to use clear black walnut for gate boards, or split up white-oak butts for fence posts. (Fig. 10.) Many valuable logs go into crossties, when they would bring the owner much more if sold as saw logs. Large numbers of young, rapid-growing trees, producing only one small tie, are cut, which, if left to grow for from three to five years, would more than double the profit.

Cutting is commonly done promiscuously without regard to continuing the future productiveness of the woodland, and large amounts of timber are commonly wasted in high stumps and long tops.

The importance of the home forest as a reserve for "pinch" times can not be overestimated. In the midst of the lumber shortage and high prices during the fall of 1919 and the spring of 1920, for example, communities and individual farms having local supplies of standing timber are reported to have suffered the least from the widespread deterioration of farm buildings and deferment of necessary new construction. The effect has been not only smaller losses of crops and live stock but better farm conditions and more contented farm labor.

Timber that is cut in the late spring and summer months should be handled with special care to avoid injury. This is because freshly cut wood is then more likely to be attacked by insects and fungi than during the cold part of the year. Seasoning also proceeds more rapidly during the warmer season and may cause excessive checking. If rightly handled, posts, poles, and logs may be cut at any season without their durability being affected. In no case should wood be allowed to lie in direct contact with the ground. The opportunity for insect attack and decay can be reduced to a minimum by peeling the timbers and open piling them off the ground in a shaded but dry place. This, however, does not retard checking of the wood.

Logs are sometimes stored under water in the hot season to prevent blue stain, checking, insect attack, and decay. Painting the ends of logs with a yellow ochre or barn paint will very materially retard injury by end checking. Painting peeled timbers with creosote will prevent sap stain and decay.

TREATING FENCE POSTS.

Every farm needs fence posts, but relatively few have sufficient supplies of lasting wood to meet home needs. This is particularly true in the Middle West and South. By means of a simple method of treating timber in open tanks with coal-tar creósote, the post and pole problem can be readily solved. By this process such short-lived woods as soft maple, beech, birch, sweet gum, black gum, young or sap pine, and red oak are made durable for use in the ground for 10 to 20 years.

A comparison of the annual costs of maintaining three fences built with posts of untreated sap pine, untreated white or post oak, treated white or post oak, and treated sap pine, respectively, indicates a saving of $8 to $23 per mile in favor of the treated pine. The following estimate is believed to be representative of the costs over a considerable part of the region where white oak or post oak and yellow pine occur:

Relative economy of treated and untreated fence posts.[1]

	Untreated sap pine.	Untreated white or post oak.	Creosoted sap pine.
Cost of post	$0.05	$0.21	$0.08
Cost of treatment			.25
Cost of setting	.15	.15	.15
Total cost of post in ground	.20	.36	.48
Average life of post in years	2	6	15
Average yearly cost	$0.10	$0.06	$0.03½
Average yearly cost of 1 mile of fence (posts 1 rod apart)	$32.00	$19.20	$10.24

[1] The costs of materials and labor, which were representive in 1922, should be regarded as showing relative rather than absolute values.

Although more expensive at the outset, creosoted posts are generally more economical to use than many kinds of untreated, short-lived woods, because of their much greater lasting qualities. The exceptions would be in remote localities with cheap wood and labor and where it would be expensive to obtain creosote. The large saving in the replacement charges, which ordinarily mount up so high in maintaining a fence, and the use of cheap and inferior kinds of wood in the first place, much more than offset the increased cost of thorough treatment with creosote. (Fig. 11.) Treated posts are a good investment and their use where lasting woods are scarce or expensive is a sign of sound judgment in farm management.

Cutting and seasoning.—It is important that the timber be peeled and thoroughly seasoned before an attempt is made to treat it. Small flakes of inner bark left on the wood prevent proper absorption of the preservative at those places. Peeling is done most easily during the spring months, but is carried on at other seasons of the year. The posts to be treated should be peeled from 3 to 4 months, depending upon the weather, before treatment, and open-piled in a dry situation to effect proper seasoning.

Kinds of posts.—Because they have a uniform absorbing surface of sap wood, round sticks are more satisfactory than split timber for treatment.

It is not profitable to treat lasting woods, such as red cedar, black locust, chestnut, and white oak. Practically all of the soft woods or sap woods may be treated and profitably used as posts.

Small-sized timber.—When treated timber is used it is not necessary to cut the large-sized line posts commonly employed untreated in the past. A post from 2 to 3 inches in top diameter, long enough to allow only a few inches above the top wire, costs less for creosoting and labor in handling, lasts as long as larger-sized timber, and possesses ample strength for ordinary fences. Small-sized trees are

abundant in second-growth timber, often being crowded out by more vigorous neighboring trees. Cutting these for fence posts utilizes

FIG. 11.—The treating of nondurable timber brings many kinds of wood into new forms of utilization. (Photo by courtesy of Iowa State College of Agriculture.)

the forest product that would often otherwise be wasted, improves the remaining stand, and furnishes profitable employment on the farm during slack time.

Kind of treatment.—Application of creosote by brushing over the whole post is only slightly effective in preventing decay, and rot often starts in small cracks which are not reached by the brush, or in checks which soon develop while the post is in use.

Open-tank treatment with a hot bath, followed by a cold bath is recommended for fence posts. The sapwood surrounding the heart-

wood takes treatment readily and is thereby protected against the entrance of decay.

Preservative.—It is important to use a good preservative, and coal-tar creosote has been found to be by far the most satisfactory material. Ordinary gas tar or coal tar has been used more or less, but it is usually too thick even when treated to give a fair degree of penetration.

Treating.—The best treatment is that which results in the deepest penetration into the wood with the least absorption of creosote. The butts of the posts should be placed for one to two hours in creosote heated to a temperature of 180° to 220° F. It is important to treat the wood to a height of a foot above the proposed ground line. In the southern States, the entire post should then be submerged into cold oil, 80° to 100° F., for one to two hours, or for such time as is necessary to get a good penetration. In the North where decay is less rapid, the cold treatment is applied usually to the butts only, the tops being treated by painting or dipping in creosote.

A satisfactory outfit for treating posts successfully consists of an upright cylindrical tank for the hot treatment, and a horizontal rectangular tank for the cold bath.

A saving in cost can be made by two or more farmers joining together in the purchase and use of treating tanks. This method in a number of instances has proved to be a successful form of cooperation.

PLANTING FOREST TREES.

The profitableness of forest planting can not be laid down by any rule, since it is subject to very wide variation. Rapid-growing kinds of trees of good, standard value can be grown profitably, however, on cheap lands located relatively near good markets. For example, as shown by actual demonstration on page 29, white pine yields very good returns in New England, and the same may be said of the yellow pines in various parts of the South. By good authorities it is held that white pine is the most profitable crop possible on large areas of New England. In the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, and Minnesota, the white pine blister rust is present, and planters of white pine should protect it from this disease by destroying all wild and cultivated currants and gooseberries within 900 feet of the plantation. These bushes are the alternate hosts of the blister rust and if permitted to remain near native or planted white pines in regions where the blister rust is prevalent, the trees become diseased and gradually die. Usually the cost of uprooting wild currant and gooseberry bushes is small.[1]

In rich agricultural belts the planting of forest trees on a large scale for direct money returns would undoubtedly prove to be

[1] For further information relative to protection from blister rust consult your State forester or the Bureau of Plant Industry, United States Department of Agriculture.

DENUDED HILLS
MEAN—
Floods.
Clogging of streams, lakes, and reservoirs.
Waste of soil.
Destruction of prosperous farms and other industries.
DEVASTATION.

a losing investment. Here, however, considerable forest planting goes on, but on relatively small, isolated tracts on farms and for special purposes, depending upon local conditions. Forest trees are planted chiefly to check soil erosion on slopes; to afford a windbreak as shelter for growing crops, live stock, and man; and to utilize to the best advantage rough, stony, or poor soils and inaccessible and wet lands.

In western Tennessee, where the soil is a very deep, rich, clay loam, known locally as "brown loam," forest planting is being extensively pushed by the State as a means of reclaiming and making profitable badly eroding lands and at the same time checking at the source of the small streams the silting which results in expensive dredging operations on the Mississippi River and its navigable tributaries. Similar conditions prevail over large areas in other States of the Mississippi Basin and in the Piedmont section and lower slopes of the Appalachians.

On the farms of the eastern United States many thousands of acres of slopes have been cleared and become waste from which the forest should never have been removed. Careful cutting by the selection method would have resulted in keeping the land continuously productive. This mistake is still going on in some rural sections where foresight and study have not yet been generally applied to farm management.

FORESTED HILLS
Protect the soil.
Store up water.
Feed springs and streams.
Support prosperous farms and other industries.
PROTECTION.

PROFIT IN GROWING TIMBER.

AN EXAMPLE.

This white pine, which was planted on an abandoned sidehill pasture of about 3 acres in New Hampshire 44 years ago, now contains about 90,000 board feet of lumber. The total outlay at the time, counting the value of the land and labor of planting, was $35. The timber to-day is worth on the stump something over $1,500.

The farmer had this strip of practically worthless sidehill, and with some spare time on hand dug up 1,400 seedling pines growing in a thicket and set them out. About 20 years later the farmer died and among his assets was this small tract of young pine for which, much to her surprise, the widow was offered $300. The second owner retained it for about 15 years and then, wishing some money, sold it. Soon afterwards it came into the hands of the present owners, a lumber company, for something over $1,000.

Assuming a land value of $5 per acre, and a charge for taxes and oversight for the period averaging $2 per acre per year, the operation has yielded a return of 5 per cent on the total investment in land, labor, and annual outlay, and in addition a neat sum equivalent to a yearly net profit from the start of $2.34 per acre.

Forest-tree planting is practicable as a means of improving the quality of the woodland and increasing the quantity and value of its product. Through carelessness, cutting, fire, and other agencies many woodlands have fallen far below their maximum capacity of production. By the application of a little intelligent guidance in making proper improvement cuttings and by affording protection from grazing animals and fire it is often possible within the period of a few years to bring about a marked change for the better in the composition and quality of the woodland. This method often succeeds better than planting trees. This is illustrated by the experience of woodland owners. A progressive farmer in Summit County, Ohio, wishing to handle his woodlands rightly, excluded all live stock by fencing and at the same time planted catalpa in the larger openings in his woods. In 10 years the forest floor, instead of being bare and packed hard, consisted of a deep layer of spongy organic matter, affording protection to the roots of the trees. A complete understory of young yellow or tulip poplars, hard maple, beech, elm, white oak, hickory, and ash had sprung up. The volunteer poplars, it should be carefully noted, had grown to from 6 to 12 feet in height and completely overtopped and suppressed the planted catalpa. Since the poplars were the more valuable of the two species because of their rapid rate of growth and the useful quality of the lumber, nature had beaten the owner at his own game. By making proper thinnings, then, in 5 years the woodland was brought to the very satisfactory condition of having a good stand of valuable species of trees filling all the openings and coming on to take the place of the mature trees as cut.

In choosing species for planting it is always best to consider first the most desirable kinds of native trees, since they are already acclimated to the local conditions and are least subject to failure. In general, the various conifers, including the pines, are to be recommended for planting in most sections of the country because they are quick growing and yield softwood, which is in more demand than the hardwoods. Cottonwood, which holds the record for the fastest production of wood, is a good tree for relatively moist situations of good soil. Black locust takes root quickly on dry slopes and possesses to a marked degree the ability to hold the soil against agents of erosion. (Fig. 12.) It is somewhat limited in its range of successful growth by a locust boring beetle, which, however, can be controlled to a great extent by means of proper spacing and handling of plantations.[1] Black walnut is probably one of the best kinds of trees for the farm, owing to the high quality and value of its wood

[1] Refer to U. S. Department of Agriculture Bulletin 787, "Protection from the Locust Borer."

and its production of edible nuts. The more desirable trees for the farm to be favored in planting over a large region of the Eastern States include also the faster-growing red oaks, white oak, ash, hickory, and yellow poplar.[1]

The planting of forest trees for shade, nut production, and ornamental purposes, as the original timber becomes scarcer, has an increasing place of importance on our farms and likewise in the towns and cities.

Information regarding the kinds of trees, ways of obtaining seed or seedlings, methods of sowing and planting, and the care of trees can be had upon application to the various State foresters or the Forest Service, U. S. Department of Agriculture. Some of the

F-[illegible]

FIG. 12.—Black locust planted on waste land, supplying the farm with fence posts and enriching the soil.

State foresters, in addition to furnishing information, supply tree seedlings of the most desirable species at cost prices.

Next to the improvement of existing woodlands by proper handling and good methods of marketing the products, no branch of farm forestry is of greater importance than forest planting.

ADDITIONAL INFORMATION.

(1) Additional information on forestry may be secured by writing to the Forester, Forest Service, Washington, D. C. A list of available forestry publications can be obtained, including those bear-

[1] Much practical information on what to plant and how to plant forest trees is found in Farmers' Bulletin 1123, "Growing and Planting Hardwood Seedlings on the Farm."

ing directly on the subject of forestry for the farm. Some are:

Care and Improvement of Farm Woods (Farmers' Bulletin 1177).
Measuring and Marketing Farm Timber (Farmers' Bulletin 1210).
Preservative Treatment of Farm Timber (Farmers' Bulletin 744).
Waste Land and Wasted Land on Farms (Farmers' Bulletin 745).
The Windbreaks as a Farm Asset (Farmers' Bulletin 1405).
Tree Planting in the Great Plains Region (Farmers' Bulletin 1312).
Machinery for Cutting Firewood (Farmers' Bulletin 1023).
Making Woodlands Profitable in the Southern States (Farmers' Bulletin 1071).
Growing and Planting Hardwood Seedlings on the Farm (Farmers' Bulletin 1123).
Growing and Planting Coniferous Trees on the Farm (Farmers' Bulletin 1453.)
Black Walnut for Timber and Nuts (Farmers' Bulletin 1392).
Selling Black-Walnut Timber (Farmers' Bulletin 1459).
Sawfly Injurious to Young Pines (Farmers' Bulletin 1259).
Protect White Pine from Blister Rust (Miscellaneous Publication 22).
Slash Pine (Farmers' Bulletin 1256).
Longleaf Pine Primer (Farmers' Bulletin 1456).
Loblolly Pine Primer (Farmers' Bulletin 1517).
Shortleaf Pine Primer (Farmers' Bulletin 1534).
Beautifying the Farmstead (Farmers' Bulletin 1087).
Street Trees (Agricultural Department Bulletin 816).
Tree Surgery (Farmers' Bulletin 1178).
Use of Wood for Fuel (Agricultural Department Bulletin 743).
Small Sawmills (Agricultural Department Bulletin 718); price, 15 cents.
Protection from the Locust Borer (Agricultural Department Bulletin 787).

(2) Circulars or bulletins on various phases of home forestry have been published by most of the State foresters. Applications for information on forestry should be addressed to the various extension specialists in forestry connected with the State agricultural colleges, to the county agents, or to the State forestry departments, as follows:

State.	Official.	Address.
Alabama	State forester	Montgomery.
California	State forester	Sacramento.
Colorado	State forester	Fort Collins.
Connecticut	State forester	New Haven.
Delaware	State forester	Dover.
Florida	State forester	Tallahassee.
Georgia	State forester	Atlanta.
Idaho	State forester	Boise.
Illinois	State forester	Urbana.
Indiana	State forester	Indianapolis.
Iowa	State forestry commissioner	Des Moines
Kansas	State forester	Manhattan
Kentucky	State forester	Frankfort.
Louisiana	Superintendent of forestry	New Orleans.
Maine	Forest commissioner	Augusta.
Maryland	State forester	Baltimore.
Massachusetts	State forester	Boston.
Michigan	State forester	Lansing.
Minnesota	Commissioner of forestry and fire prevention	St. Paul.
Mississippi	State forester	Jackson.
Missouri	State forester	Columbia.
Montana	State forester	Missoula.
Nebraska	State forester	Lincoln.
New Hampshire	State forester	Concord.
New Jersey	State forester	Trenton.
New York	Superintendent, State forests	Albany.
North Carolina	State forester	Raleigh.
North Dakota	State forester	Bottineau.
Ohio	State forester	Wooster.
Oklahoma	Secretary, forest commission	Oklahoma City.
Oregon	State forester	Salem.
Pennsylvania	Secretary, department of forests and waters	Harrisburg.
Rhode Island	Commissioner of forestry	Chepachet.
South Carolina	State forester	Columbia.

State.	Official.	Address.
South Dakota	Forest supervisor	Custer.
Tennessee	State forester	Nashville.
Texas	State forester	College Station.
Vermont	Commissioner of forestry	Montpelier.
Virginia	State forester	Charlottesville.
Washington	State supervisor of forestry	Olympia.
West Virginia	Chief game protector	Buckhannon.
Wisconsin	Superintendent, State forests and parks	Madison.

(3) Sets of about 50 colored lantern slides, each accompanied by a syllabus, or lecture, will be loaned to schools and other educational agencies by the Forest Service for short periods on condition that borrowers agree to pay transportation charges, to be responsible for slides lost or broken, and to forward the slides promptly and in good condition upon request. Application should be made as far in advance of the need as possible, since the sets are usually engaged for a considerable time in advance. The subjects upon which sets are available are:

Forestry in Agriculture.
Farm Forestry in the South.
Tree Windbreaks.
Street Trees.
Farm Woodlands.
Nature Study and Forestry.
Forest Botany.
Manual Training and Forestry.
Geography and Forestry.
Life of a Tree.
Conservation of the Forest.
Forestry in the United States.
The Work of the Forest Service.
Recreation on National Forests.
The Forest in Relation to Erosion and Stream Flow.

Application should be made to the Forester, Forest Service, Washington, D. C., for the loan of any of the above sets of lantern slides.

F-[illegible]

FIG. 13.—Forest trees needed to check soil erosion and make land bring an income.

WOODLANDS on farms in the eastern half of the United States would form a strip 100 miles in width reaching from New York to San Francisco.

Farmers own as much forest land as do all the lumbermen and other private holders together.

Farms contain more than one-half the entire hardwood forest area of the United States.

Woods occupy a larger part of the farms of this country than does any other crop; in fact as much as all the cereal crops combined.

The haphazard cutting of trees with no plan or thought for the future invariably results in the deterioration of the woods, both in quality and value. Often the rapid-growing, straight trees are cut because they can easily be worked up, and yet these are the very ones that should be left to develop into high-grade timber.

Using good pasture land to support scrub stock and devoting woodland to the growing of inferior trees are both examples of mismanagement on the farm.

Many woodlots on farms consist of park-like stands of defective trees having little commercial value. The forest should be so dense that little grass can grow. If stock need additional shade some woodland may be included in the pasture. The attempt to combine stock grazing with timber growing in farm woods is neither good grazing practice nor profitable forestry.

A forest without young growth is like a community of old people; it will die out.

Timber is a national necessity; the supply of it is being rapidly depleted. By growing more timber, the farmer increases his own income and benefits the public.

On the poorer lands of many farms in the United States white pine, ash, oak, hickory, poplar, black walnut, cottonwood, black locust, shortleaf pine, or slash pine is the best-paying crop.

On remote farms, where buyers formerly would make no offer on less than a carload of timber, good roads and the motor truck have made it possible for the farmer to sell individual trees at fair prices.

The total value of the timber product from farm woodlands in 1919 (1920 census) increased to about double that of 1910, or to about $394,000,000.

FORESTRY INCREASES FARM INCOME BY

1. Making waste lands yield a profit by growing timber on

Poor soils	Wet lands
Steep slopes	Unused corners
Rocky lands	Eroded lands.

2. Furnishing paying employment for men and teams during the winter.
3. Utilizing timber better on the farm and avoiding waste by
   - Cutting low stumps and small tops,
   - Using substitute woods in construction,
   - Treating nonlasting woods.
4. Increasing crop yields by planting forest tree windbreaks.
5. Growing more and better timber on the farm through
   - Protecting the woods from fire and overgrazing,
   - Selecting for cutting the mature, defective, overcrowded, and inferior kinds of trees, and leaving the straight, thrifty, and better kinds,
   - Planting to fill openings in woods.
6. Marketing the higher grades of wood products direct to consumers at fair prices as

Saw logs	Posts
Poles	Pulpwood
Piling	Firewood
Cooperage bolts	Spoke blocks
Handle bolts	Tannin bark.

MAKE YOUR WOODLAND PERMANENTLY PROFITABLE.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

July 17, 1929

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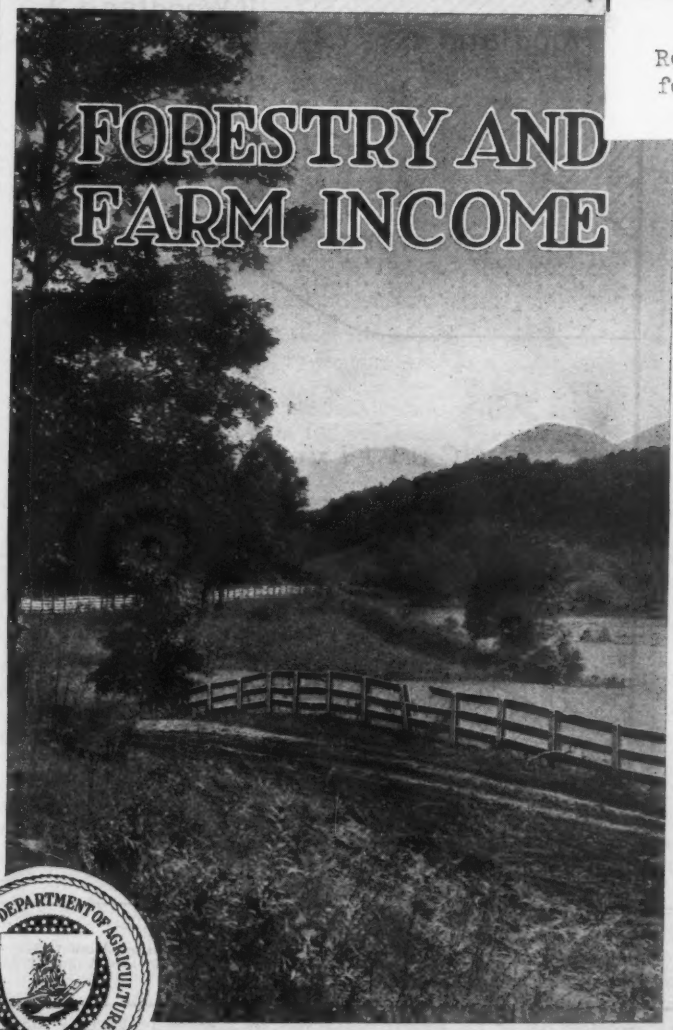
FORESTRY AND FARM INCOME



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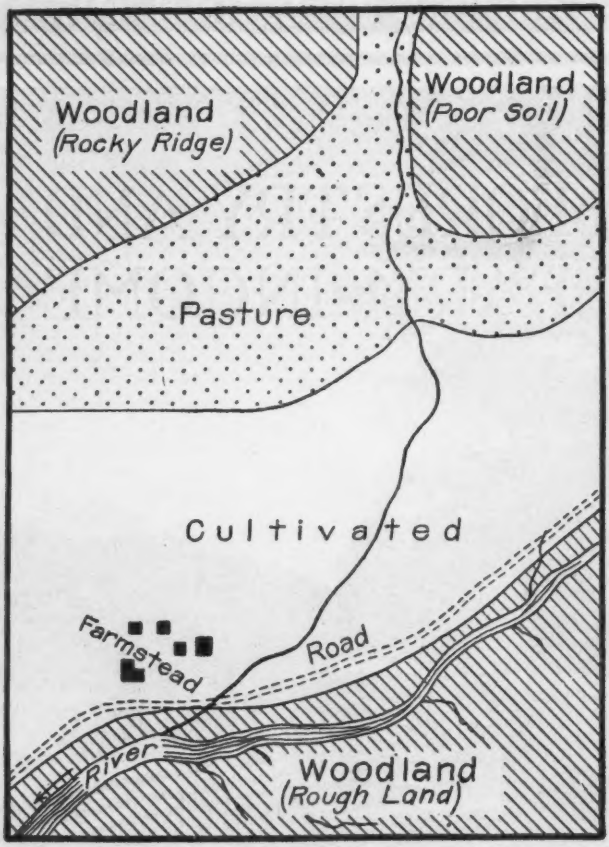
NO IDLE LAND ON THE FARM



Woodland on the hills, pasture land on the slopes, and cultivated land below

Washington, D.C.

Issued August 1920
Revised August 1933

FORESTRY AND FARM INCOME

By WILBUR R. MATTOON, *extension forester, Branch of Public Relations, Forest Service*

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WHY FARM FORESTRY PAYS

THE RIGHT HANDLING of forest trees on the farm will make it more prosperous, add to its comforts as a home, and enhance its value as an investment.

The home forest, in many sections of the country, will supply the timber which the farm needs for buildings, fences, fuel, repairs of all kinds, and many other uses; and there will often be a surplus which can be sold in the form of standing timber, saw logs, posts, poles, crossties, pulpwood, fuelwood, and blocks or billets for making spokes, handles, spools, boxes, barrels, and excelsior.

A well-cared-for home forest serves also as a windbreak for buildings, a shelter for livestock, a protection of valuable lands from erosion, a means of profitable employment for men and teams during otherwise spare or idle time, a place of recreation, and an improvement in the appearance of the farm.

Trees improve and build up the soil. The leaves, small twigs, and other tree litter decompose and form a layer of dark-colored vegetable mold, which enriches the soil and stores up soil moisture. By means of this layer of mold, the binding of the soil by the roots of the trees, and the resistance of the trunks to the rapid flow of water, the woods prevent floods from gullying or destroying the land by erosion, particularly on steep slopes.

Even if a farmer sells no timber the woodland pays. The firewood, fence posts, and material for repair and construction on the farm, the time and money saved by having them conveniently on hand, and the protection against extremes of weather afforded the crops, farm buildings, and stock are worth considerably more than the trouble and expense of raising and caring for the trees.

The woods need not occupy good farm land that will grow other crops. Trees are, as a rule, grown on the less fertile, stony, thin, or poorly-drained soils and on steep slopes. Unused corners and

small uncultivated spots about the farm are good places for rapid-growing, useful trees. The chief economic reason for timber growing on the farm is to get a money return from those portions which would otherwise be unproductive.

Though the land on which the farm forest is situated may not be suitable for other crops, it should not be treated as waste land (fig. 1). By comparatively little care it can be made to produce timber of value. Only a little attention is required, and this may be given in the winter or when other farm work is slack. Many trees that used to have slight value, and even small trees that used to be counted as brush to be got rid of, are now generally used for commercial purposes.

A permanent woodland is an essential part of a well-equipped farm; and more than ever before farm woodland has become a valuable asset convertible into money.

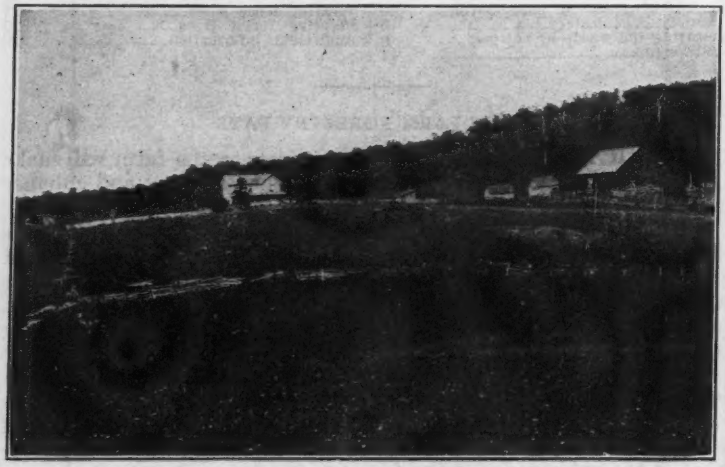

FIGURE 1.—Timber for the farm and for market, and shelter for the farmstead from woodland covering a stony ridge.

EXTENT OF FARM WOODLANDS

About one third of all the forest land of the United States is on farms. According to the 1930 census figures (table 1), this means that the farm woodlands amounted in all to about 150,000,000 acres. This is equivalent, roughly, to the aggregate area of Pennsylvania, Maryland, Delaware, Virginia, Ohio, Illinois, and Kentucky. If placed contiguously, they would form a solid strip 100 miles in width reaching from New York to the eastern border of California.

The total woodland on farms east of the Rocky Mountains (fig. 2) amounts to 133,000,000 acres, or 89 percent of the total in the country. It covers an area as large as the entire forest lands of nearly all central and western Europe, including France, Germany, Switzerland, Austria, Denmark, Belgium, Netherlands, Poland, Czechoslovakia, Spain, Portugal, and Italy.

TABLE 1.—*Farm-woodland information, by States, including areas and values of all timber products cut on farms*

[1930 census—values for year 1929]

State	Farm-woodland area	Average woodland per farm	Proportion of farm land wooded	Farms	Total area of all farm land	Value of farm timber products in 1929
New England:	*Acres*	*Acres*	*Percent*	*Number*	*Acres*	*Dollars*
Maine	2,240,910	57	48.3	39,006	4,639,938	7,913,650
New Hampshire	1,071,997	72	54.7	14,906	1,960,061	3,063,363
Vermont	1,503,681	60	38.6	24,898	3,896,097	4,905,080
Massachusetts	862,569	34	43.0	25,598	2,005,461	2,981,126
Rhode Island	121,589	37	43.5	3,322	279,361	330,776
Connecticut	599,405	35	39.9	17,195	1,502,279	1,688,410
Middle Atlantic:						
New York	3,634,239	23	20.2	159,806	17,979,633	16,259,744
New Jersey	278,892	11	15.9	25,378	1,758,027	735,277
Pennsylvania	3,363,315	20	22.0	172,419	15,309,485	7,679,546
East North Central:						
Ohio	2,773,629	13	12.9	219,296	21,514,059	5,740,367
Indiana	2,619,480	14	13.3	181,570	19,688,675	5,375,846
Illinois	2,741,756	13	8.9	214,497	30,695,339	4,557,100
Michigan	3,234,738	19	18.9	169,372	17,118,951	8,801,817
Wisconsin	5,705,392	31	26.1	181,767	21,874,155	16,925,577
West North Central:						
Minnesota	4,746,303	26	15.4	185,255	30,913,367	10,756,988
Iowa	2,213,504	10	6.5	214,928	34,019,332	5,225,950
Missouri	7,709,000	30	22.8	255,940	33,743,019	11,850,371
North Dakota	557,742	7	1.4	77,975	38,657,894	486,550
South Dakota	490,557	6	1.3	83,157	36,470,083	544,705
Nebraska	940,219	7	2.1	129,458	44,708,565	1,408,528
Kansas	1,109,506	7	2.4	166,042	46,975,647	2,306,529
South Atlantic:						
Delaware	203,698	21	22.6	9,707	900,815	419,876
Maryland	1,213,103	28	27.7	43,203	4,374,398	2,270,018
District of Columbia	479	5	15.6	104	3,071	449
Virginia	6,695,156	39	40.0	170,610	16,728,620	12,028,661
West Virginia	3,128,550	38	35.5	82,641	8,802,348	4,070,330
North Carolina	8,326,434	30	46.1	279,708	18,055,103	15,184,145
South Carolina	3,902,535	25	37.5	157,931	10,393,113	5,824,378
Georgia	8,372,937	33	37.9	255,598	22,078,630	8,861,877
Florida	1,891,838	32	37.6	58,966	5,026,617	1,262,546
East South Central:						
Kentucky	4,796,626	19	24.1	246,499	19,927,286	6,662,901
Tennessee	5,413,347	22	30.1	245,657	18,003,241	13,021,166
Alabama	6,485,981	25	36.9	257,395	17,554,635	8,504,708
Mississippi	6,224,309	20	35.9	312,663	17,332,195	9,280,785
West South Central:						
Arkansas	5,443,255	22	33.9	242,334	16,052,962	7,769,391
Louisiana	2,659,113	16	28.4	161,445	9,355,437	3,231,438
Oklahoma	4,059,493	20	12.0	203,866	33,790,817	2,829,534
Texas	15,689,483	32	12.6	495,489	124,707,130	8,440,281
Mountain:						
Montana	1,819,906	38	4.1	47,495	44,659,152	964,202
Idaho	859,908	21	9.2	41,674	9,346,908	938,979
Wyoming	515,643	32	2.2	16,011	23,525,234	279,396
Colorado	1,541,463	26	5.3	59,956	28,876,171	524,553
New Mexico	1,818,134	58	5.9	31,404	30,822,034	403,432
Arizona	616,992	44	5.9	14,173	10,526,627	382,006
Utah	191,336	7	3.4	27,159	5,613,101	35,749
Nevada	66,373	19	1.6	3,442	4,080,906	53,056
Pacific:						
Washington	1,874,240	26	13.8	70,904	13,533,778	3,262,215
Oregon	3,122,215	57	18.9	55,153	16,548,678	3,908,087
California	4,502,755	33	14.8	135,676	30,442,581	2,090,486
Total or average	149,945,725	24	15.2	6,288,648	986,771,016	242,042,245

The average acreage of woodland on farms in the United States is about 24 acres per farm. This amount varies widely, however, in the different sections of the country, ranging from 51 acres in New England to 16 in the West North Central States (table 2).

Farms contain more than one half the entire hardwood forest lands of the United States. On the farms of this country the woods occupy a larger portion of the total land area than any other crop; in fact as much as all the cereal crops combined.

In the New England States more than 24 percent of all forested lands is on farms, and in Ohio, Indiana, Illinois, and Iowa from 80 to 100 percent. In the Southern States the farms contain about one third of all the forest lands, or a total of more than 84,500,000 acres. In Maryland, Virginia, North Carolina, Kentucky, and Texas 40 out of every 100 acres of forest land is on farms.

Information concerning the areas of farm woodland, percentages of farmland wooded, total number of farms, and other subjects will be found by States in table 1 and by regions in table 2.

FIGURE 2.—Important farm woodland area east of the Rocky Mountains.

TABLE 2.—*Farm woodlands by regions, number of farms, and total farm land*

Region	Total farm woodland area	Average area of woodland per farm	Proportion of farm land wooded	Farms	Total area of farm land
	Acres	*Acres*	*Percent*	*Number*	*Acres*
New England (Maine, N.H., Vt., Mass., R.I., Conn.)	6,400,151	51.2	44.8	124,925	14,283,197
Middle Atlantic (N.Y., N.J., Pa.)	7,276,446	20.3	20.7	357,603	35,047,145
South Atlantic (Del., Md., D.C., Va., W.Va., N.C., S.C., Ga., Fla.)	33,734,730	31.9	39.0	1,058,468	86,362,715
East North Central (Ohio, Ind., Ill., Mich., Wis.)	17,074,995	17.7	15.4	966,502	110,891,179
West North Central (Minn., Iowa, Mo., N.Dak., S.Dak., Nebr., Kans.)	17,758,831	16.0	6.7	1,112,755	265,487,907
East South Central (Ky., Tenn., Ala., Miss.)	22,920,203	21.6	31.4	1,062,214	72,817,357
West South Central (Ark., La., Okla., Tex.)	27,851,344	25.2	15.2	1,103,134	183,906,346
Mountain (Mont., Idaho, Wyo., Colo., N.Mex., Ariz., Utah, Nev.)	7,429,755	30.8	4.7	214,314	157,450,133
Pacific (Wash., Oreg., Calif.)	9,499,210	36.3	15.6	261,733	60,525,037
Total or average	149,945,725	24.0	15.2	6,288,648	986,771,016

VALUE OF WOODLAND PRODUCTS

Considerable income may be derived from the home forest. The total value of forest products taken from timbered land on farms reported in the 1930 census, and shown in table 3, was $242,042,245. Over half of this represents the value of wood and various minor wood products used on the farm and the rest the value of the products sold, or cut and held for sale. For the farms reporting (2,558,899, or 40.7 percent of all the farms), this amounted to an average of about $95 per farm.

The value of the various forest products cut yearly on farms in New England amounted to nearly $21,000,000. The same item for the 14 Southern States from Maryland to Oklahoma and Texas makes a total yearly value of over $105,000,000. Each of 7 States reported more than $10,000,000 as the value of forest products cut on their farms, as follows, beginning with the highest: Wisconsin ($16,925,577), New York ($16,259,744), North Carolina ($15,184,145), Tennessee ($13,021,166), Virginia ($12,028,661), Missouri ($11,850,371), and Minnesota ($10,756,988). They were followed by Mississippi, Georgia, Michigan, Alabama, Texas, Maine, and Pennsylvania, each of which cut forest products worth more than $7,000,000.

Saw logs and veneer logs, crossties, poles and piling, fence posts, pulpwood, and fuel wood are the chief timber products cut on farms (table 3). Nearly 41 (40.7) farms out of every 100 in 1929 (according to the 1930 census) cut some timber products. Fuel wood is an important item. In 1929 an average of 14 cords was cut per farm reporting, or a total for the country of 34,100,529 cords. Piled continuously, this would reach twice around the world at the equator

TIMBER GROWING IN THE EASTERN PART OF THE UNITED STATES PAYS BECAUSE—

1. There is plenty of cheap land unfit for agriculture.
2. The abundant rainfall permits rapid tree growth.
3. Transportation facilities by rail and water are good.
4. Numerous large cities furnish a market.
5. The region is far removed from the virgin supplies of the Pacific Northwest.

and overlap for a distance of 1,600 miles. The total value was $151,245,458. Fence posts are essential on the farm, and the farmers cut 98,664,249, or an average of 174 per farm. The saw logs and veneer logs cut on farms in 1929 amounted to a total of 5,000,000,000 board feet. The value of this material at the farm was $47,637,752. Farms produce relatively smaller amounts of saw timber and more of the total cut of fuel wood, posts, crossties, and pulpwood.

TABLE 3.—*Quantities of various timber products cut on farms and their total values, by regions* [1]

Region	Kind of timber product						Value of all products
	Saw logs and veneer logs	Fuel wood	Pulpwood	Posts	Crossties	Poles and piling	
	Board feet	*Cords*	*Cords*	*Number*	*Number*	*Number*	*Dollars*
New England [2]	409,252,000	1,534,323	286,889	1,468,516	341,349	73,604	20,882,405
Middle Atlantic [2]	255,585,000	2,771,188	79,522	9,382,626	911,863	406,226	24,674,567
East North Central [2]	375,540,000	5,211,268	209,153	16,731,088	1,504,810	233,578	41,400,707
West North Central [2]	260,909,000	4,557,450	163,700	25,263,432	1,564,757	236,258	32,579,621
South Atlantic [2]	1,579,573,000	7,881,673	398,631	8,512,614	2,961,920	986,297	49,922,280
East South Central [2]	1,409,725,000	6,241,856	161,882	12,571,457	3,634,212	549,763	37,649,560
West South Central [2]	359,713,000	4,356,687	124,324	19,579,414	3,842,006	348,494	22,270,944
Mountain [2]	59,784,000	406,370	7,253	2,428,843	234,501	244,314	3,581,373
Pacific [2]	332,845,000	1,149,714	54,405	2,726,259	343,368	219,881	9,260,788
Total quantity	5,042,926,000	34,110,529	1,485,759	98,664,249	15,338,786	3,298,415	
Total value..dollars	47,637,752	151,245,458	11,364,389	15,316,161	10,000,642	6,477,843	242,042,245

[1] Values by States are shown in table 1.
[2] For names of States included, see table 2.

Census of 1930.

SECURING GOOD FOREST GROWTH

At present farm woodlands are yielding, as a rule, only from one third to one half the wood they could grow. This is because only a few farmers realize the possibilities in their woodlands and give them proper care. As a result the home forest, which is close at hand, where comparatively little attention each year in protecting, cutting, and utilizing the timber would be very profitable, is in poor condition.

The amount of timber that an acre can grow in a year varies a good deal with the quality of the soil and moisture supply and the kind and number of the trees per acre. If fully stocked with trees and well cared for, an acre of hardwoods should grow yearly from about one half to one cord of wood and an acre of pine from one to two cords, a cord being equivalent to about 500 board feet of saw timber. Growth averages rather less in the northern part of the country because of the shorter season and somewhat more in the warmer southern part.

The chief essentials in keeping the trees growing are excluding fires and allowing the humus to collect on the forest floor. Large openings in the woods reduce the annual yield of timber and should not be allowed to occur. The length of time required to reach merchantable size varies with the kind of tree and the use to which its wood is to be put. Posts and crossties of some kinds may be grown in from 10 to 30 years, and most kinds of quick-growing trees will be large enough for saw timber in from 20 to 40 years.

After logging, a new stand of young trees generally starts naturally from seeds or sprouts from stumps. The natural seeding process in the woods can be helped by turning hogs into the woodland before the seed falls, or by harrowing the ground or conducting logging operations in a good seed year just previous to or shortly after

WOOD INSURES WINTER JOB

A farmer, settling on a quarter section of cut-over timberland in northern Wisconsin, reserved 70 acres for permanent woodland and cleared the rest. The natural timber was pine, spruce, and fir. After a few years he began cutting timber carefully, always leaving the thriftiest and best to grow. This was winter work for him and his sons.

During a period of 31 years he has kept a record of the amount of timber cut and the money received for it. The timber cut has amounted to 700,000 board feet of saw logs, which has brought him in an average gross return of $500 in cash yearly. Yet by his good management and cutting, the land at the end of the period (1932) has about 275,000 feet of standing timber.

The owner, in speaking of his forestry operations, admits that his woods have often been a source of temptation to him. "Many times in those earlier years", he said, "when cash was needed badly I was tempted to sell all the timber in one lump. But I did not do it. I knew that if I held on to my timber there would always be a winter job and some cash coming in. I am glad today that I never let it go."

the seed falls. By these means, the soil is stirred up, the seeds come in contact with it, and germinate more readily.

Some points to be remembered about trees which sprout are (1) the most thrifty sprouts come from clean, well-cut stumps felled during the late fall, winter, or very early spring before the sap begins to flow; and (2) the top of the stump should be cut smooth

so as to shed water. Trees which sprout successfully include such hardwoods as the oaks, hickories, chestnut, basswood, gums, cottonwood, and willows, and young shortleaf and pitch pines.

PINE POLES FROM AN OLD POTATO PATCH

A young man from Nebraska moved on to a small, poor, sandy-land farm in southern Mississippi. Two acres of abandoned land, worn out in growing potatoes and watermelons, came up in longleaf pine saplings. This "brush", as the neighbors called such patches, meant more to this young farmer from the treeless plains than to the local residents, and he protected the young trees from fire. Later when the neighbors, in a friendly spirit, advised him to cut and burn his saplings in order to avoid the State tax on growing timber he refused to take their advice.

The young trees grew rapidly under protection, and the land became covered with a crowded stand of tall, straight poles. One day a timber buyer came along the sandy road. He looked over the stand, which he found contained more than 1,000 merchantable poles, and offered the owner $600 for the standing trees. This was more "cash money" than the farmer had seen at one time in many years, and he gladly closed the deal at the buyer's figure, although at current stumpage prices the timber was worth considerably more money.

With no expense for labor or fertilizer, the farmer's timber crop yielded him a good net profit averaging $5 an acre yearly for a period of 35 years.

Woodlands may also be restocked with young trees by planting out small seedlings grown in nursery beds or dug up in the woods, or under some conditions by sowing the tree seeds. If trees are

to be planted, it is well to select those native to the region which grow most rapidly and produce the most useful kinds of wood (fig. 3).

NUMBER OF TREES IN GOOD NATURAL STANDS

Often the question is raised as to how many trees there should be in a well-stocked natural stand, namely, one that is not too dense or too open. The number varies with the prevailing sizes or diameters of the trees and also with the kind, or species, of tree. Table

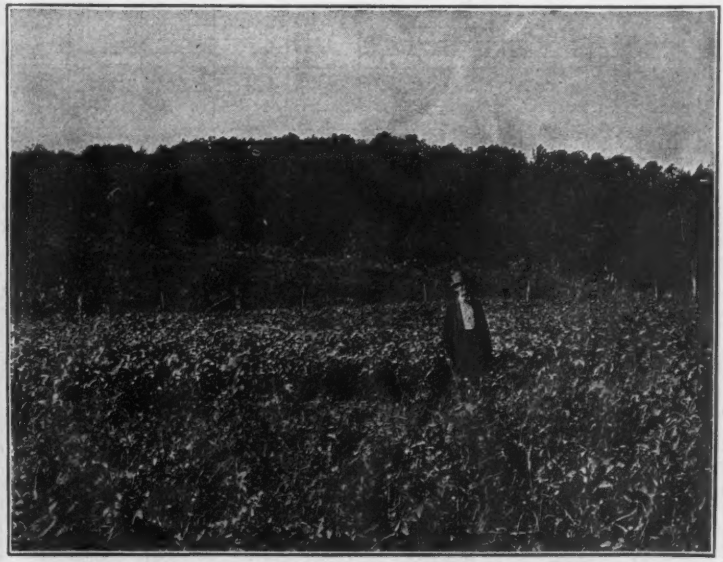

FIGURE 3.—Thrifty woods, good crops, and a happy farmer.

4, for example, shows the number of trees of different diameters and the total number of trees per acre for stands of four different groups or ranges of tree diameters. This holds generally good for natural stands of a good number of different kinds of trees in the eastern part of the United States. Those which demand much light, or are intolerant, such as the ash, black walnut, and red pine, must have an abundance of light and usually consume more soil moisture, and there should be somewhat fewer trees of these kinds per acre. Likewise trees such as the sugar maple, beech, yellow birch, and white pine, which can tolerate considerable shade, might stand closer together.

IMPROVING THE WOODS BY CUTTING

When rightly handled, a stand of timber yields continuous or repeated harvests. It should be cut with an eye to its continuous production on the land. The aim should be to keep the land producing timber of the best quality at the fastest rate.

TABLE 4.—*Number of trees per acre of different sizes in well-stocked stands* [1]

Trees of like size		Number of trees of diameter—			
Diameter at breast height [2] (inches)	Number	2 to 10 inches	2 to 14 inches	6 to 18 inches	10 to 24 inches
2	2,000	400	300		
4	900	180	130		
6	510	105	75	75	
8	320	65	45	45	
10	235	50	30	30	30
12	170		25	25	20
14	130		20	20	16
16	100			15	12
18	85			12	11
20	75				9
22	65				8
24	55				7
Total		800	625	222	113

[1] Based on data compiled by the University of Michigan.
[2] Height of 4½ feet above the ground. Trees measured outside the bark.

Not all that is merchantable should be cut. In timber production on farms, it is not sufficient to leave only enough seed trees to restock the land. This would mean too long a wait between harvests.

TREES TO CUT FOR IMPROVING THE WOODS

Trees which are well suited for firewood and the removal of which will lead to an improvement of the remaining trees in the stand.

Trees which have been overtopped by others and have had their growth stunted.

Diseased trees, or trees seriously injured by insect attacks, or trees extremely liable to such injury; for example, chestnut in the region subject to blight or birch in the gipsy-moth area.

Badly fire-scarred trees.

Trees of the less valuable species, such as beech, birch, black oak, blackjack oak, or black gum, crowding the more valuable sugar maple, white or shortleaf pines, yellow poplar, or white oak.

Crooked trees and large-crowned, short-boled trees that will not make good lumber and that are crowding or overtopping others.

Slow-growing trees crowding fast-growing species of equal value.

Sound dead trees, both standing and down.

Mature trees that have reached their full growth.

There should always be plenty of younger trees as a good basis for growing later crops and also trees of larger sizes that can be cut at frequent intervals and keep up the cash income from timber.

Good management should result in a home forest fully stocked with sound, well-shaped trees of valuable and useful kinds that are growing as fast as possible. This can be brought about largely by "weeding", or cutting out the inferior kinds—the "weed" trees—for exactly the same reason that weeds are hoed out of the cornfield. The good trees need the light, space, soil moisture, and plant food that would otherwise be taken by the less valuable trees. Sometimes it becomes advisable to fill openings or improve the quality of the woods by planting seeds or seedlings of desirable kinds of trees.

FIGURE 4.—Woods improved by right cutting.

Dead and dying trees, diseased trees, deformed trees which shade out better ones, the less valuable kinds of trees, such as gray birch, aspen, blackjack oak, dogwood, sourwood, blue beech, ironwood, and others, and the less promising trees in crowded groups should be removed. The last operation is known as "thinning." By following these practices each year improvement in the forest is brought about in a relatively short time.

The wood removed in improvement cuttings often need not be a loss. It should be considered as an early crop that can be used or sold, generally at a price to show a profit on the work of thinning, while the woods are made more valuable by its removal (figs. 4, 5, and 6).

It is sometimes advisable to prune trees in forest stands, more especially in immature or younger stands of the more valuable kinds or in thrifty promising stands of any sort. The purpose is to clean the trunk of side branches, causing it to develop clear, high-grade

timber which commands higher prices. Such forest pruning began to be practiced first in New England with stands of white pine, where it has proved to be generally profitable. It is coming into good practice with farmers and other small owners in the Southern States on shortleaf, loblolly, slash, and longleaf pine; also on black

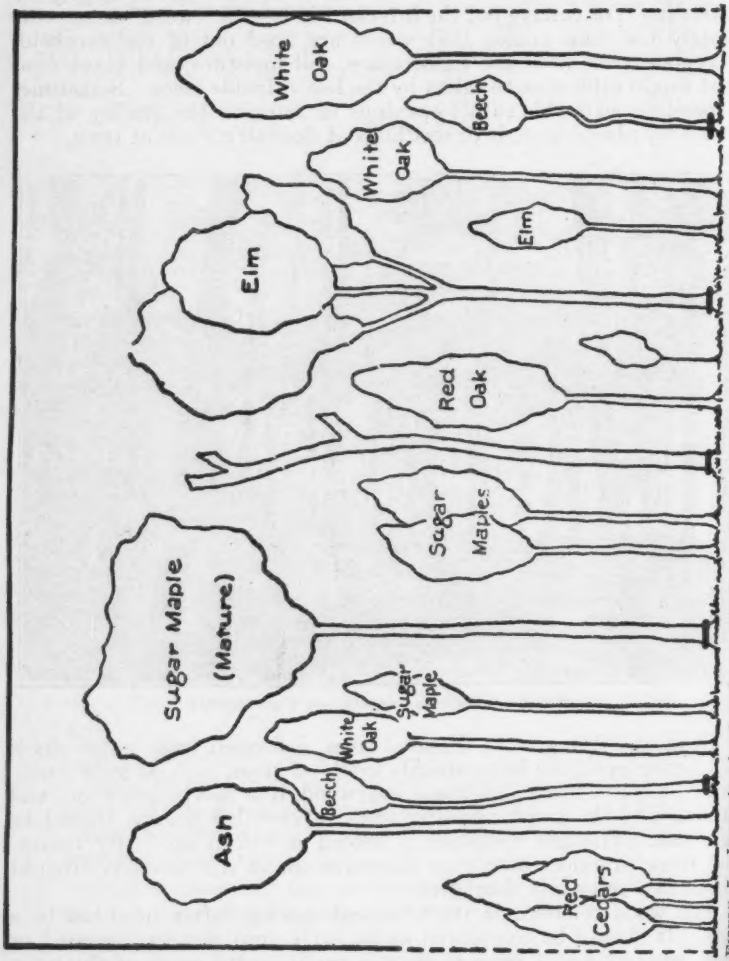

FIGURE 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species are marked at the base to be cut. A good stand will be left of thrifty middle-aged and promising young trees.

walnut, black locust, pine, and spruce forest plantations in the Central and Lake States.

Much more often than is commonly realized, grapevines and some other kinds of vines kill or stunt valuable trees, especially those that have rather open foliage like the black walnut, ashes, and locusts, and also trees standing in the open. The damage is caused by the

FIGURE 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species are marked at the base to be cut. A good stand will be left of thrifty middle-aged and promising young trees.

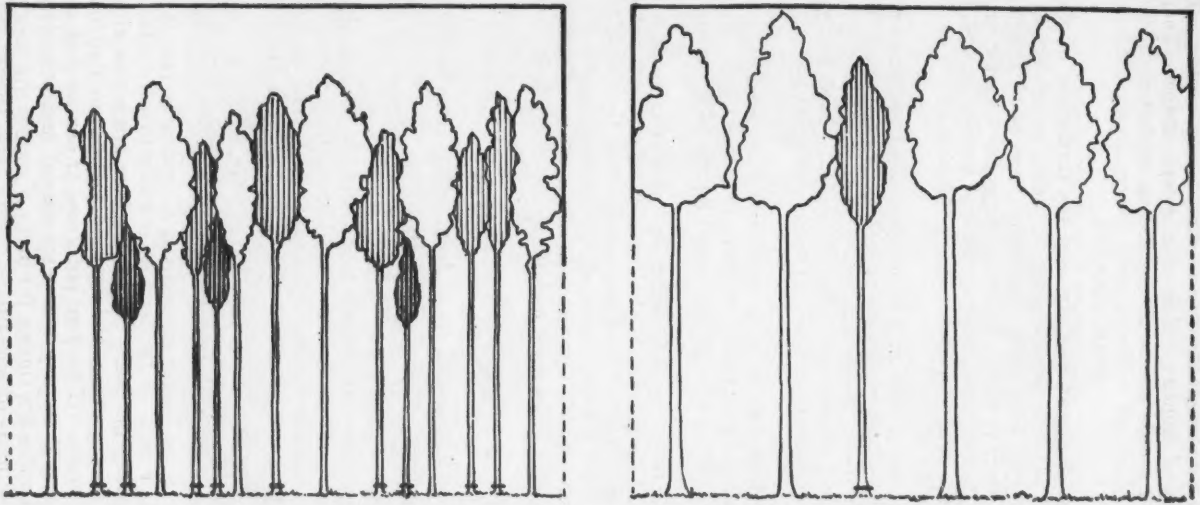

FIGURE 6.—The growth and value of pine are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber: A, before thinning—15 overcrowded trees (shaded trees to be cut); B, the same stand 5 years later, after thinning—6 larger and more valuable trees (shaded tree to be cut).

vines spreading their leaves above those of the tree, which are thus shaded out, and as a result the tree becomes sickly or dies. This is an insidious form of damage, which often escapes notice. Therefore, cutting the vines should not be overlooked or neglected.

GOOD LOGGING

The right use of the ax and saw and the protection of the land from fire are the keys to the growing of timber profitably and perpetually as a crop. This right use comes from good judgment in the selection of trees to be cut and in cutting and logging carefully. Lack of proper care in these two essentials of protection and cutting has resulted in the ruin of many pieces of valuable timber-producing land.

The trees to be cut should each be selected in advance and marked, preferably by the use of whitewash or a cheap white paint. Blazing the trunks with an ax causes wounds in trees, which sometimes are left standing for long periods before being cut. Mistakes made in marking trees with an ax are not so easily remedied as those made with a brush.

Cutting should be done so as to cause the least possible injury or destruction to other living trees, particularly young trees. In felling trees advantage should always be taken of natural openings in the woods.

Stumps should be cut low—12 inches or less in height—thus taking the best timber, which is usually in the base of the tree. Cases are known in which enough good-grade timber has been left in high stumps to have paid for the entire cost of the logging.

Logs should be cut well into the tops of the trees. The upper log or logs usually will yield only low-grade lumber, but it should be utilized.

Advantage should be taken of crooks to cut the ends of logs at crooks rather than between them.

All brush should be pulled away from living trees in logging to lessen the fire damage and, in southern pines, also the menace of infestation of beetles, or so-called "worms." Care against the outbreak and spread of fire is of extreme importance.

In getting logs out of the woods care should be used to avoid all unnecessary injury or damage to living trees, both young growth and mature trees. The healing of wounds is a slow process, and wounds in the bark are often serious as they freely admit infection of disease and the attack of insects.

ESTIMATING AND SELLING TIMBER

When timber is no longer growing at a profitable rate it should be cut and used or sold. A farmer who is ready to sell timber would profit by measuring his trees, estimating how much saw timber or other product they contain, and making inquiry to find out how much they are worth. If he does not know or cannot find out how to do this, he should employ some experienced and reliable person to estimate and value his timber for him.

The customary units of measure in selling farm timber are board feet, cords, linear feet, and the piece. A board foot, for example,

is 12 inches long, 12 inches wide, and 1 inch thick, or its equivalent. The standard cord of wood is 4 feet high, 4 feet wide, and 8 feet long. The linear foot is a measure of length only, without regard to the other dimensions of the material. Piece measure is only a count of the pieces in any form in which the wood is sold.

FIGURE 7.—Fast-growing hickory is in demand for implement handles and spokes.

Logs and standing trees are usually estimated in board feet. Saw timber is measured in board feet. Round timber, such as poles and piling, is usually sold by the linear foot. Firewood, pulpwood, and wood cut in short lengths for distillation, handle stock (fig. 7), and other uses are usually sold by the cord. Fence posts, ties, telephone poles, and some other forms of timber are sold by the piece.

Saw timber in the standing tree is estimated by measuring the diameter of the tree, outside the bark, at breast height (4½ feet above the ground), and measuring or estimating the height of the tree. When these measurements are known, the contents of the tree can be found from a volume table.[1] Often the length of the part of the trunk to be used is taken in units, or number of 16-foot logs, instead of the total height of the tree.

A volume table is one showing in board feet the amount of timber that can be sawed from trees of given heights and diameters or from a given number of merchantable logs and diameters. For example, a volume table for white oak would show that a tree 18 inches in diameter (measured outside the bark at breast height) and having three merchantable 16-foot logs will saw out 286 board feet of lumber. Volume tables are made for different kinds of trees, each table based on the average of many measures of felled trees.

[1] For volume tables and other information on estimating and measuring timber, see Farmers' Bulletin 1210, Measuring and Marketing Farm Timber, or apply to State foresters. Price 10 cents.

TEN HELPS IN MARKETING WOODLAND PRODUCTS

1. Get a reliable estimate of the amount and value of the timber to be sold. If necessary get experienced help. Know what you want to sell.

2. Before selling, consult neighbors who have sold timber, and benefit from their experiences.

3. Investigate local timber requirements and prices. Your products may be worth more locally because transportation is saved.

4. Get prices for various wood products from as many sawmills and other wood-using plants as possible.

5. Advertise in papers and otherwise secure outside competition.

6. Secure bids, if practicable, both by the lump and by log-scale or other unit measure.

7. Be sure that you are selling to responsible purchasers.

8. Market the higher grades of timber and use the cheaper for farm purposes.

9. Remember that standing timber can wait over a period of low prices without rapid deterioration.

10. Use a written agreement in selling timber, especially if the cutting is to be done by the purchaser.

A saw log is measured by taking the length of the log and its diameter inside the bark at the small end, then employing a log rule to estimate the amount or number of board feet it contains. A log rule is a statement of the estimated number of board feet of lumber that can be sawed from logs of different lengths and sizes. A good rule for 12-foot logs is to multiply the diameter inside bark at the small end by half the diameter. For shorter logs the contents will be proportional to the length of the logs. Thus, a 12-foot log 16 inches in diameter will saw out about 16 × 8 or 128 board feet, while a 10-foot long log 14 inches in diameter will cut $\frac{10}{12}$ of 14×7, or 81⅔ board feet.

It is very important to consider what log rule is to be used, because much depends upon it in measuring and selling timber. There is a great difference in the amount of timber and likely often in the resulting money return.

The International rule (table 5) gives log volumes that closely approximate what can be sawed out by using good methods. Owners of small logs for sale will benefit when this or some equally close rule has come into general use.

TABLE 5.—*International log rule*

[The contents of logs in board feet, by using a circular saw, cutting ¼-inch kerf, and sawing carefully by good methods]

Diameter of log at small end and inside bark (inches)	Contents of log in board feet when length of log is—												
	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet	19 feet	20 feet
4	2	2	3	3	4	5	5	5	6	7	7	8	9
5	4	5	6	7	7	8	9	11	12	13	15	16	17
6	7	9	10	11	13	14	16	18	19	21	23	25	27
7	12	14	15	17	19	21	24	26	28	31	34	36	39
8	16	19	21	24	27	30	33	36	39	42	46	49	52
9	23	26	29	33	36	40	43	47	51	55	59	63	68
10	29	33	37	42	45	51	54	59	64	69	75	82	89
11	36	42	46	52	57	63	68	74	80	86	95	100	107
12	44	51	57	62	70	77	83	91	97	103	111	119	129
13	52	60	68	76	83	92	100	108	116	124	134	143	151
14	62	71	80	98	107	107	117	127	136	147	158	168	176
15	73	82	94	104	114	125	136	146	157	170	181	195	204
16	84	96	108	119	131	144	156	167	181	194	207	222	233
17	96	110	123	136	149	163	177	192	205	221	235	251	265
18	110	124	139	155	169	185	201	218	232	250	267	282	300
19	123	140	156	175	190	210	225	244	261	280	299	317	337
20	138	157	174	197	212	232	251	270	290	310	330	352	374
21	152	172	193	215	234	256	279	299	321	344	366	389	413
22	168	192	214	238	259	282	307	330	354	379	404	429	453
23	186	212	235	260	285	310	337	362	388	415	445	470	498
24	203	232	257	285	311	339	367	396	424	452	484	514	543
25	223	253	281	311	339	370	400	433	462	494	526	560	590
26	241	273	304	337	368	402	435	468	502	537	570	606	640
27	262	296	329	364	400	434	471	504	543	580	617	657	692
28	281	319	356	395	432	470	509	545	586	623	664	706	748
29	303	344	383	425	463	505	546	587	630	670	712	756	801
30	326	369	411	455	498	542	586	628	674	719	765	810	858

The Doyle rule (table 6), although very inaccurate for small-sized timber, is probably most commonly used in the United States. To determine the number of board feet in a log by this rule, deduct 4 inches from the diameter of the small end, then square one fourth the remainder and multiply the product by the length in feet.

For example, a log measuring 20 inches at the small end and 12 feet long contains 192 feet. The Doyle rule, in many sections the standard and in some States the legal rule, is unfair to the seller for measuring logs below 28 inches in diameter. In the early days of large cheap timber it was fairly satisfactory, but for small-sized timber it gives such low values as to make it unsatisfactory. The Scribner rule is fairer than the Doyle. Careful sawing, however, should result in 10 to 20 percent more lumber from second-growth timber than is credited by the Scribner rule.

TABLE 6.—*Doyle log rule*

Diameter of log at small end and inside bark (inches)	Contents of log in board feet when length of log is—												
	6 feet	7 feet	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet
6	1	2	2	2	2	3	3	3	3	4	4	4	4
7	3	4	4	5	5	6	7	7	8	8	9	10	10
8	6	7	8	9	10	11	12	13	14	15	16	17	18
9	9	11	12	14	16	17	19	20	22	23	25	27	28
10	13	16	18	20	22	25	27	29	31	34	36	38	40
11	18	21	24	28	31	34	37	40	43	46	49	52	55
12	24	28	32	36	40	44	48	52	56	60	64	68	72
13	30	35	40	46	51	56	61	66	71	76	81	86	91
14	37	44	50	56	62	69	75	81	87	94	100	106	112
15	45	53	60	68	76	83	91	98	106	113	121	129	136
16	54	63	72	81	90	99	108	117	126	135	144	153	162
17	63	74	84	95	106	116	127	137	148	158	169	180	190
18	73	86	98	110	122	135	147	159	171	184	196	208	220
19	84	98	112	127	141	155	169	183	197	211	225	239	253
20	96	112	128	144	160	176	192	208	224	240	256	272	288
21	108	126	144	163	181	199	217	235	253	271	289	307	325
22	121	142	162	182	202	223	243	263	283	304	324	344	364
23	135	158	180	203	226	248	271	293	316	338	361	384	406
24	150	175	200	225	250	275	300	325	350	375	400	425	450
25	165	193	220	248	276	303	331	358	386	413	441	469	496
26	181	212	242	272	302	333	363	393	423	454	484	514	544
27	198	231	264	298	331	364	397	430	463	496	529	562	595
28	216	252	288	324	360	396	432	468	504	540	576	612	648
29	234	273	312	352	391	430	469	508	547	586	625	664	702
30	253	296	338	380	422	465	507	549	591	634	676	718	760

In finding a buyer for his timber the owner should inquire of his neighbors who have sold, or at local sawmills, wood yards, wood-using factories, railroad stations, and telegraph and telephone companies. He should also advertise in the papers and write personal letters furnishing a brief description of the kind, quality, and amount of timber for sale, in order to awaken competition among local and outside buyers. Securing a number of bids for the same piece of timber will tend to develop the best market and increase returns. It is well to have a written agreement as to the manner in which the timber shall be cut, and the amount and form of payment [2] (fig. 8).

Some of the industries buy their supplies largely or wholly in the log; hence, in many cases it will pay the farmer to look up these special markets for his logs, bolts, poles, ties, etc. Industries buying their supplies more or less generally in the form of round timber are manufacturers of handles, cooperage, veneer, woodenware and novelties, shuttles, bobbins and spools, vehicle stock, athletic goods, and pulpwood. Poles are purchased by electric-lighting, power, and tele-

[2] For further information see Farmers' Bulletin 1210 (price 10 cents), or apply to your State forestry agencies.

phone companies. Markets for piling will be found by applying to railroads, wharf, bridge, and bulkhead contractors in the larger towns and cities. For prices on ties, consult the nearest local railroad station agent. Cordwood is used by brickmakers, bakeries, limekilm operators, and fuel dealers in towns.

FIRE PROTECTION

The forest must be protected. Fire, careless logging, tree diseases, insect pests, and, in the hardwoods, grazing are the principal sources of injury.

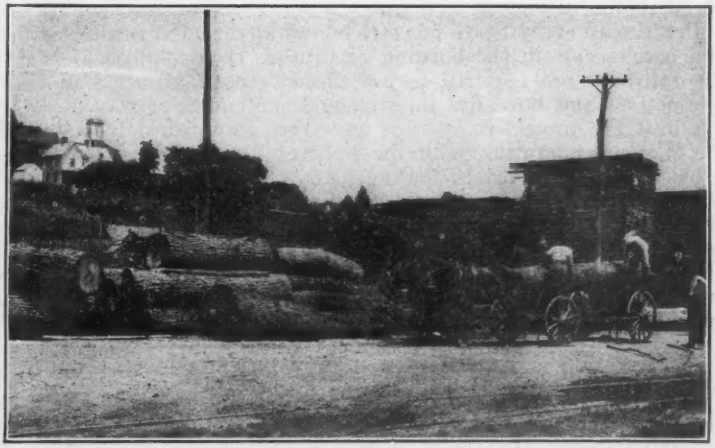

FIGURE 8.—Choice logs bring high prices and are often shipped long distances

Fire kills the little trees and weakens full-grown trees so that they may become diseased or infested with insects. It also destroys the humus cover of leaves and twigs that ordinarily protects the trees against summer drought and heat, conserves water for the springs and streams, and enriches the soil by adding nitrogen.

HELP PREVENT WOODS FIRES

BE SURE your match is out before throwing it away.
DON'T throw away burning tobacco.
CHOOSE a safe place and make your camp fire small.
PUT OUT your fire with water and then cover it with earth.
DON'T make large brush heaps. Choose a still day for burning, and plow furrows to protect near-by woods.

BE CAREFUL WITH FIRE

Dead trees and tops cut in logging are a fire menace and should, if possible, be utilized. Saw logs or firewood can be made out of the dead trees, and the unused large tops should be lopped so that they will lie close to the ground and rot quickly.

Some idea of the prevalence of fires in the United States east of the Rocky Mountains may be formed from the fact that here occur 90 out of every 100 forest fires. For the 5 years of 1926 to 1930, inclusive, an average of 145,448 fires yearly in this region burned over 39,948,304 acres of land and caused an enormous property loss. While fires were reported from all States, a greater number of fires occurred in the southern pine district than in any other important forest region.

Practically every State has strict laws against the setting of fire and carelessness in the burning of brush. In a number of States the railroads are required to use efficient spark arresters in their locomotives and burn fire lines along their rights of way.

Forest fire protective systems have been established by many of the States cooperating with the Federal Forest Sevice under the provisions of the Clarke-McNary Act. Patrolmen are employed who travel through the districts where there is danger of forest fires, watch for fire, and educate the public in the need for care in preventing fire and for getting quickly to any fire that may occur. Owners of woodland should get in touch with the State foresters and fire patrolmen, and secure their cooperation and assistance in keeping down fire hazard and damage.

GRAZING AND INSECT DAMAGE

Horses and cattle eat and break down young trees and pack the ground hard. Sheep and goats destroy large numbers of small trees by eating them. Hogs root up the ground, digging up the young trees and roots and sometimes eating the roots. They also prevent young trees from starting by devouring the nuts and other seeds from which they grow. On the other hand, however, trees bearing small or unpalatable seeds often start well after hogs have rooted up the leaf litter and soil.

Some people fear that good pasture will be wasted by keeping stock out of the woods. This is hardly true, since a fully stocked woodland has little or no grass in it, for the reason that there is insufficient light (fig. 9). Studies in farm management in northwestern Pennsylvania show that an open stand of trees, such as occur in average wooded pastures, reduces the pasturage value of the land as much as 65 to 70 percent.[3] Grass in the woods is a sign that the stand is in poor condition and that the trees are too far apart for growing a good quality and large amount of timber. This does not apply in the southern longleaf pine region or in some of the western forests, where much good timber occurs in open stands. Grass grown under the shade of trees is less nutritious than that grown in the open, so its actual food value is small.

Plenty of shade for livestock should be provided in pastures, but pasture land and woodland are most profitable when managed separately, each for the growing of its own individual product.

[3] Agriculture Bulletin 853, The Organization and Management of Farms in Northwestern Pennsylvania. (Price 10 cents.)

Woodland may be guarded against serious insect damage and disease by removing dead or dying trees and all those showing signs of insect attack or decay. In the South, pine should be cut in the cool part of the year. When it is cut in the summer, bark beetles and wood borers injure the cut trees, multiply rapidly, and spread to living trees, which they often kill by eating the rich inner bark for food. A special treatment for weevil-infested white pine has been developed. In cases of insect menace or injury it would be best to get into communication with the Bureau of Entomology, United States Department of Agriculture, or the State entomologist.

FIGURE 9.—Little or no grass grows in a fully stocked woodland.

USING TIMBER AT HOME

Lack of knowledge of the proper use of timber is one form of farm mismanagement.

It is a mistake to saw up choice logs of white oak, ash, cherry, and yellow poplar for rough uses at home, or to use clear black walnut for gate boards, or split up white oak butts for fence posts (fig. 10). Many valuable logs go into crossties, when they would bring the owner much more if sold as saw logs. Large numbers of young, rapid-growing trees, producing only one small tie, are cut, which, if left to grow for from 3 to 5 years, would more than double the profit.

Cutting is commonly done promiscuously without regard to continuing the future productiveness of the woodland, and large amounts of timber are commonly wasted in high stumps and long tops.

The importance of the home forest as a reserve for "pinch" times cannot be overestimated. In the period of business reorganization beginning in about 1930, for example, communities and individual farms having local supplies of standing timber were in a favorable condition since lumber, pulpwood, ties, poles, and especially fuel wood, kept moving although in restricted amounts. Farmers with

such supplies also had materials for repair of farm buildings and necessary new construction.

Timber that is cut in the late spring and summer months should be handled with special care to avoid injury. This is because freshly cut wood is then more likely to be attacked by insects and fungi than during the cold part of the year. Seasoning also proceeds more rapidly during the warmer season and may cause excessive checking. If rightly handled, posts, poles, and logs may be cut at any season without their durability being affected. In no case should wood be allowed to lie in direct contact with the ground. The opportunity for insect attack and decay can be reduced to a minimum by peeling

FIGURE 10.—Because they split easily, clear white oak butt logs have been worked up into fence posts when several farmers could have jointly shipped a carload at fancy prices.

the timbers and open-piling them off the ground in a shaded but dry place. This, however, does not retard checking of the wood.

Logs are sometimes stored under water in the hot season to prevent blue stain, checking, insect attack, and decay. Painting the ends of logs with a yellow ocher or barn paint will very materially retard injury by end checking. Painting peeled timbers with creosote will prevent sap stain and decay.

Well-seasoned fuel wood makes more heat and saves time and worry in the home. Thus a woodshed may be a good investment in more ways than in money saving.

TREATING FENCE POSTS

Every farm needs fence posts, but relatively few have sufficient supplies of lasting wood to meet home needs. This is particularly true in the Middle West and South. By means of a simple method of treating timber in open tanks with coal-tar creosote, the post and

pole problem can be readily solved. By this process such short-lived woods as soft maple, beech, birch, sweet gum, black gum, young or sap pine, and red oak are made durable for use in the ground for 10 to 30 years (table 7).

TABLE 7.—*Relative economy of treated and untreated fence posts* [1]

	Untreated sap pine	Untreated white or post oak	Creosoted sap pine
Cost of post	$0.05	$0.21	$0.08
Cost of treatment			.25
Cost of setting	.15	.15	.15
Total cost of post in ground	.20	.36	.48
Average life of post	[2] 2	[2] 6	[2] 15
Average yearly cost	0.10	0.06	0.03⅓
Average yearly cost of 1 mile of fence (posts 1 rod apart)	32.00	19.20	10.24

[1] The costs of materials and labor should be regarded as showing relative rather than absolute values.
[2] Years.

The treating of fence posts is an unusually favorable project for cooperation on the part of several farmers. This refers especially to buying equipment and supplies of coal-tar creosote.

A comparison of the annual costs of maintaining four fences built with posts of untreated sap pines, untreated white or post oak, treated white or post oak, and treated sap pine, respectively, indicates a saving of $8 to $23 per mile in favor of the treated pine.

Although more expensive at the outset, creosoted posts are generally more economical to use than many kinds of untreated, short-lived woods, because of their much greater lasting qualities. The exceptions would be in remote localities with cheap wood and labor and where it would be expensive to obtain creosote. The large saving in the replacement charges, which ordinarily mount up so high in maintaining a fence, and the use of cheap and inferior kinds of wood in the first place, much more than offset the increased cost of thorough treatment with creosote (fig. 11). Treated posts are a good investment, and their use where lasting woods are scarce or expensive is a sign of sound judgment in farm management.

Cutting and seasoning.—It is important that the timber be peeled and thoroughly seasoned before an attempt is made to treat it. Small flakes of inner bark left on the wood prevent proper absorption of the preservative at those places. Peeling is done most easily during the spring months, but is carried on at other seasons of the year. The posts to be treated should be peeled from 3 to 4 months, depending upon the weather, before treatment, and open-piled in a dry situation to effect proper seasoning.

Kinds of posts.—Because they have a uniform absorbing surface of sap wood, round sticks are more satisfactory than split timber for treatment. It is not profitable to treat lasting woods, such as red cedar, black locust, chestnut, and white oak. Practically all of the softwoods or sapwoods may be treated and profitably used as posts.

Small-sized timber.—When treated timber is used it is not necessary to cut the large-sized line posts commonly employed untreated in the past. A post from 2 to 3 inches in top diameter, long enough

to allow only a few inches above the top wire, costs less for creosoting and labor in handling, lasts as long as larger-sized timber, and possesses ample strength for ordinary fences. Small-sized trees are abundant in second-growth timber, often being crowded out by more vigorous neighboring trees. Cutting these for fence posts utilizes the forest product that would often otherwise be wasted, improves

FIGURE 11.—The treating of nondurable timber brings many kinds of wood into new forms of utilization. (Photo by courtesy of Iowa State College of Agriculture.)

the remaining stand, and furnishes profitable employment on the farm during slack time.

Kind of treatment.—The application of creosote by brushing over the whole post is only slightly effective in preventing decay, and rot often starts in small cracks which are not reached by the brush, or in checks which soon develop while the post is in use. Open-tank treatment with a hot bath followed by a cold bath is recommended for fence posts. The sapwood surrounding the heartwood takes treatment readily and is thereby protected against the entrance of decay.

Preservative.—It is important to use a good preservative, and coal-tar creosote has been found to be by far the most satisfactory material. Ordinary gas tar or coal tar has been used more or less, but it is usually too thick even when treated to give a fair degree of penetration.

Treating.—The best treatment is that which results in the deepest penetration into the wood with the least absorption of creosote. The butts of the posts should be placed for 1 to 2 hours in creosote heated to a temperature of 180° to 220° F. It is important to treat the wood to a height of a foot above the proposed ground line. In the Southern States the entire post should then be submerged into cold oil, 80° to 100°, for 1 to 2 hours, or for such time as is necessary to get a good penetration. In the North, where decay is less rapid, the cold treatment is applied usually to the butts only, the tops being treated by painting or dipping in creosote.

A satisfactory outfit for treating posts successfully consists of an upright cylindrical tank for the hot treatment and a horizontal rectangular tank for the cold bath.

A saving in cost can be made by two or more farmers joining together in the purchase and use of treating tanks. In a number of instances this has proved to be a successful form of cooperation.

PLANTING FOREST TREES

The profitableness of forest planting cannot be laid down by any rule, since it is subject to very wide variation. Rapid-growing trees of good, standard value can often be grown profitably by farmers on portions of worn-out or idle lands or as a commercial enterprise on cheap lands located relatively near good markets. Examples may be cited of white and red pines in New England, black locust and black walnut in many districts of the eastern part of the United States, and shortleaf, loblolly, longleaf, and slash pines in the Southern States.

White pine, especially when planted in mixture with hardwoods, and red pine are among the most promising crops for large areas of the Northeastern States. The largest known reforestation operation undertaken by an individual private landowner is one carried on in the upper portion of the Hudson River in eastern New York, where one owner has planted about 5,500 acres, using a total of 5,473,600 small trees, mostly white, red, and Scotch pines and Norway spruce. In the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, Minnesota, and elsewhere the white pine blister rust is present, and planters of white pine should protect it from this disease by destroying all wild and cultivated currants and gooseberries within 900 feet of the plantation. These bushes are the alternate hosts of the blister rust and if they are permitted to remain near native or planted white pines in localities where the blister rust is prevalent the trees become diseased and gradually die. Usually the cost of uprooting wild currant and gooseberry bushes is small.[4]

Large areas of fine young forest stands have been established in the South by setting out 1-season-old seedlings of the four important

[4] For further information relative to protection from blister rust consult your State forester or the Bureau of Plant Industry, U.S. Department of Agriculture.

RETURNS IN GROWING TIMBER IN NEW HAMPSHIRE

This white pine was planted on an abandoned sidehill pasture of about 3 acres in New Hampshire. At the age of 44 years (shown in the illustration) it contained about 90,000 board feet of lumber. The total outlay at the time, counting the value of the land and labor of planting, was $35. The timber was worth on the stump something over $1,500.

The farmer had this strip of practically worthless sidehill, and with some spare time on hand dug up 1,400 seedling pines growing in a thicket and set them out. About 20 years later the farmer died and among his assets was this small tract of young pine for which, much to her surprise, the widow was offered $300. The second owner retained it for about 15 years and then, wishing some money, sold it. Soon afterwards it came into the hands of the third owners, a lumber company, for something over $1,000.

Assuming a land value of $5 per acre, and a charge for taxes and oversight for the period averaging $2 per acre per year, the operation yielded a return of 5 percent on the total investment in land, labor, and annual outlay, and in addition a neat sum equivalent to a yearly net profit from the start of $2.34 per acre. To get this return required favorable markets.

kinds of pines. The largest such young planted forest is located in southeastern Louisiana, where a lumber company has planted 30,000 acres. Hundreds of farmers in the South are turning worn-out farm lands into timber production by planting yearling pines. In the piedmont the pines are mostly the shortleaf and loblolly, and in the lower piedmont and Coastal Plain they are the slash and longleaf pines. Both of the latter trees yield crops of crude turpentine, from which spirits of turpentine and rosin are produced. Owners often say that the return from the "gum" is double that obtained later from the timber.

Of the two trees, the slash pine is more extensively planted because of its very rapid growth when young and its heavy yield of gum or crude turpentine. One farmer in south Georgia has reforested about 2,000 acres of his worn-out cotton fields by planting slash pine seedlings at the rate of about 750 per acre, or a total of 1,500,000 trees.

In rich agricultural belts the planting of forest trees on a large scale for direct money returns would undoubtedly prove to be a losing investment. There, however, considerable forest planting goes on, but on relatively small, isolated tracts on farms and for special purposes, depending upon local conditions. Forest trees are planted chiefly to check soil erosion on slopes; to afford a windbreak as shelter for growing crops, livestock, and man; to produce Christmas trees; and to utilize to the best advantage rough, stony, or poor soils and inaccessible and wet lands. Black walnut is one of the best trees to plant in good soil over much of the region.

In western Tennessee, where the soil is a very deep, rich, clay loam, known locally as "brown loam", the planting of black locust trees has been extensively pushed by the State as a means of reclaiming and making profitable badly eroding lands and at the same time checking at the source of the small streams the silting which results in expensive dredging operations on the Mississippi River and its navigable tributaries. Similar conditions prevail over large areas in other States of the Mississippi Basin and in the piedmont and lower slopes of the Appalachians.

On the farms of the eastern part of the United States many thousands of acres of slopes, from which the forest should never have been removed, have been cleared and have become waste. Careful cutting by the selection method would have resulted in keeping the land continuously productive. This mistake is still going on in some rural sections where foresight and study have not yet been generally applied to farm management.

Forest-tree planting is practicable as a means of putting idle land to producing, checking soil erosion, regulating stream flow, and improving the quality of woodlands by increasing the quantity and value of their product. Through carelessness, cutting, fire, and other agencies, many woodlands have fallen far below their maximum capacity of production. By the application of a little intelligent guidance in making proper improvement cuttings and by affording protection from grazing animals and fire, it is often possible within the period of a few years to bring about a marked change for the better in the composition and quality of the woodland. This method

often succeeds even better than planting trees. This is illustrated by the experience of woodland owners. A progressive farmer in Summit County, Ohio, wishing to handle his woodlands rightly, excluded all livestock by fencing and at the same time planted catalpa in the larger openings in his woods. In 10 years the forest floor, instead of being bare and packed hard, consisted of a deep layer of spongy organic matter, affording protection to the roots of the trees. A complete understory of young yellow or tulip poplars, hard maple, beech, elm, white oak, hickory, and ash had sprung up. The volunteer poplars had grown to from 6 to 12 feet in height and completely overtopped and suppressed the planted catalpa. Inasmuch as the poplars were the more valuable of the two species

FIGURE 12.—Black locust planted on waste land, supplying the farm with fence posts and enriching the soil.

because of their rapid rate of growth and the useful quality of the lumber, nature had beaten the owner at his own game. By making proper thinnings, then, in 5 years the woodland was brought to the very satisfactory condition of having a good stand of valuable species of trees filling all the openings and coming on to take the place of the mature trees as cut.

In choosing species for planting it is always best to consider first the most desirable kinds of native trees, since they are already acclimated to the local conditions and are least subject to failure. In general, the various conifers, including the pines, are to be recommended for planting in most sections of the country because they are quick-growing and yield softwood, which is in more demand than the hardwoods. Cottonwood, which is known for its rapid production of wood, is a good tree for relatively moist situations on good soil. Black locust takes root quickly on dry slopes and possesses to a marked degree the ability to hold the soil against agents of erosion (fig. 12). It is somewhat limited in its range of successful growth by a locust boring beetle, which, however, can be con-

trolled to some extent by means of proper spacing and handling of plantations.[5] Black walnut is probably one of the best kinds of trees for the farm, owing to the high quality and value of its wood and its production of edible nuts. They should never be planted in close formation but in widely spaced orchards or small groups and only on good agricultural soils.[6] The more desirable trees for the farm to be favored in planting over a large region of the eastern States include also the red and white pines, European larch and Norway spruce in the northern States, and shortleaf, loblolly, longleaf, and slash pines in the southern States, and yellow (or tulip) poplar and black locust in the eastern uplands and mountains.[7]

The planting of forest trees for shade, nut production, and ornamental purposes, as the original timber becomes scarcer, has a place of increasing importance on our farms and likewise in the towns and cities.

Information regarding the kinds of trees, ways of obtaining seed or seedlings, methods of sowing and planting, and the care of trees can be had upon application to the agricultural county agents, various State forestry agencies, or the Forest Service, United States Department of Agriculture.

The Federal Government is not authorized to distribute stock for forest planting, but under the provisions of the Clarke-McNary law it is cooperating with many of the State forestry departments in the growing and distribution of small trees for planting on farms for timber production or windbreaks.

Next to the improvement of existing woodlands by proper handling and good methods of marketing the products, no branch of farm forestry is of greater importance than forest planting (fig. 13).

ADDITIONAL INFORMATION

Additional information on various phases of forestry or timber farming can be had by writing to your State forestry department at the State capitol or to the extension service, State college of agriculture, or by applying to the county agricultural agent.

Federal publications on farm forestry include the following, which may be had at the prices indicated, in coin or money order, by addressing the Superintendent of Documents, United States Government Printing Office, Washington, D.C.:

Farmers in Northern States Grow Timber as Money Crop. (Farmers' Bulletin 1680). 5 cents.
Profits from Farm Woods (Southern States) Miscellaneous Publication 87). 5 cents.
The Farm Woods, a Savings Bank (Leaflet 29). 5 cents.
Making Woodlands Profitable in the Southern States (Farmers' Bulletin 1071). 5 cents.
Care and Improvement of the Farm Woods (Farmers' Bulletin 1177). 5 cents.
Measuring and Marketing Farm Timber (Farmers' Bulletin 1210. 10 cents.
Sawfly Injurious to Young Pines (Farmers' Bulletin 1259). 5 cents.
Use of Logs and Poles in Farm Construction (Farmers' Bulletin 1660). 10 cents.

[5] Refer to Farmers' Bulletin 1628, Growing Black Locust Trees. (Price 5 cents.)
[6] See Leaflet 84, Planting Black Walnut. (Price 5 cents.)
[7] Much practical information on what to plant and how to plant forest trees is found in Farmers' Bulletin 1123, Growing and Planting Hardwood Seedlings on the Farm (price 5 cents), and Farmers' Bulletin 1453, Growing and Planting Coniferous Trees on the Farm (price 10 cents).

Production of Maple Sirup and Sugar (Farmers' Bulletin 1366). 5 cents.
Pulpwood Crops in the Northeast (Leaflet 57). 5 cents.
More Turpentine, Less Scar, Better Pine (Leaflet 83). 5 cents.
Small Trees Wasteful to Cut for Saw Timber (Leaflet 55). 5 cents.
Planting Black Walnut (Leaflet 84). 5 cents.
Black Walnut for Timber and Nuts (Farmers' Bulletin 1392). 5 cents.
Growing Black Locust Trees (Farmers' Bulletin 1628). 5 cents.
Growing and Planting Coniferous Trees on the Farm (Farmers' Bulletin 1453). 10 cents.
Growing and Planting Hardwood Seedlings on the Farm (Farmers' Bulletin 1123). 5 cents.
Christmas Trees as a Cash Crop for the Farm (Farmers' Bulletin 1664). 5 cents.

FIGURE 13.—Forest trees needed to check soil erosion and make land bring an income.

The Windbreak as a Farm Asset (Farmers' Bulletin 1405). 5 cents.
Planting and Care of Shelter Belts on the Northern Great Plains (Farmers' Bulletin 1603). 5 cents.
Shortleaf Pine (Farmers' Bulletin 1671). 10 cents.
Loblolly Pine Primer (Farmers' Bulletin 1517). 10 cents.
Slash Pine (Farmers' Bulletin 1256). 5 cents.
Longleaf Pine Primer (Farmers' Bulletin 1486). 5 cents.
Southern Pine Beetle Serious Enemy of Pines in the South (Farmers' Bulletin 1586). 5 cents.
Chestnut Blight (Farmers' Bulletin 1641). 10 cents.
Nut Tree Propagation (Farmers' Bulletin 1501). 10 cents.
Basket Willow Culture (Farmers' Bulletin 622). 5 cents.
Trees for Roadside Planting (Farmers' Bulletin 1482). 5 cents.
Trees for Town and City Streets (Farmers' Bulletin 1208). 5 cents.
Planting and Care of Street Trees (Farmers' Bulletin 1209). 5 cents.
Propagation of Trees and Shrubs (Farmers' Bulletin 1567). 5 cents.
Transplanting Trees and Shrubs (Farmers' Bulletin 1591). 10 cents.
Pine Tree Treasures (Miscellaneous Publication 106). 5 cents.
Protect White Pine from Blister Rust (Miscellaneous Publication 22). 10 cents.
Currants and Gooseberries, their Culture and Relation to Blister Rust (Farmers' Bulletin 1398). 10 cents.
The Forest, A Handbook for Teachers (Miscellaneous Circular 98). 10 cents.

Film strips and sets of about 50 colored lantern slides, each accompanied by a syllabus, or lecture, will be loaned to schools and other educational agencies by the Forest Service or the Extension Service (Washington, D.C.) for short periods on condition that borrowers agree to pay transportation charges, to be responsible for slides lost or broken, and to forward the borrowed material promptly and in good condition upon request. Application should be made as far in advance of the need as possible. Among the subjects upon which slides are available are:

Forestry in agriculture.
Farm forestry in the South.
Tree windbreaks.
Farm woodlands.
Farm forestry in the Northeastern States.
Life of a tree.
Conservation of the forest.
Forestry in the United States.
The work of the Forest Service.
Keeping livestock out of the woods in the North Central States.

Application should be made to the Forester, Forest Service, or to the Director, Extension Service, United States Department of Agriculture, Washington, D.C., for the loan of any of these sets of lantern slides.

FORESTRY INCREASES FARM INCOME

BY

1. Making waste lands yield a profit by growing timber on
   - Poor soils
   - Steep slopes
   - Rocky lands
   - Wet lands
   - Unused corners
   - Eroded lands.
2. Furnishing paying employment for men and teams during the winter.
3. Utilizing timber better on the farm and avoiding waste by
   - Cutting low stumps and small tops,
   - Using substitute woods in construction,
   - Treating nonlasting woods.
4. Increasing crop yields by planting forest-tree windbreaks.
5. Growing more and better timber on the farm through
   - Protecting the woods from fire and overgrazing,
   - Selecting for cutting the mature, defective, overcrowded, and inferior kinds of trees, and leaving the straight, thrifty, and better kinds,
   - Planting to fill openings in woods.
6. Marketing the higher grades of wood products direct to consumers at fair prices as
   - Saw logs
   - Poles
   - Piling
   - Cooperage bolts
   - Handle bolts
   - Posts
   - Pulpwood
   - Firewood
   - Spoke blocks
   - Tannin bark.

MAKE YOUR WOODLAND PERMANENTLY PROFITABLE

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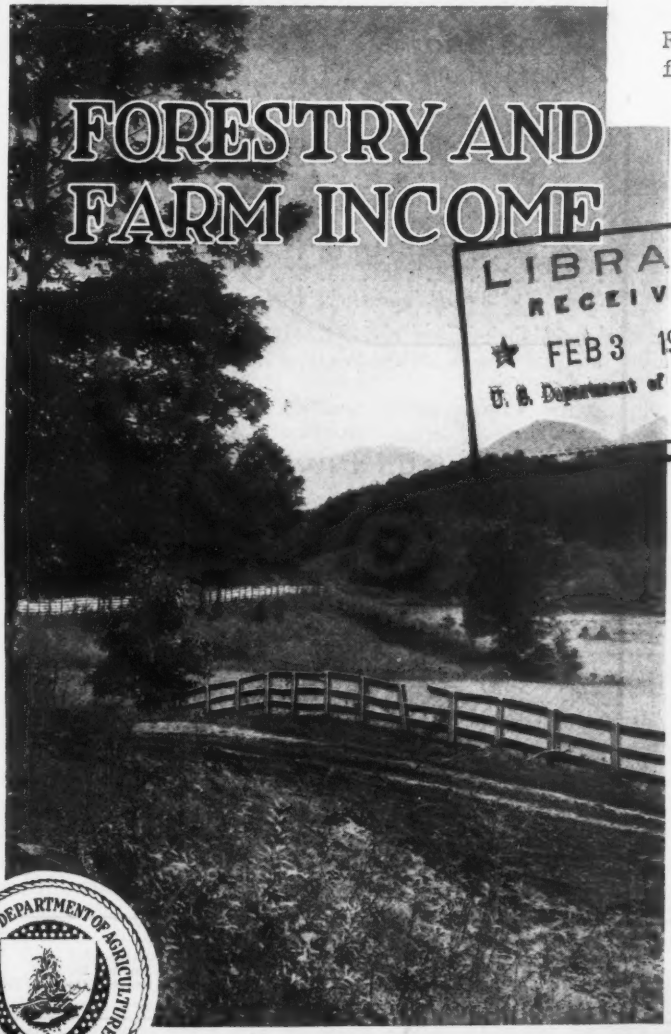
FORESTRY AND FARM INCOME



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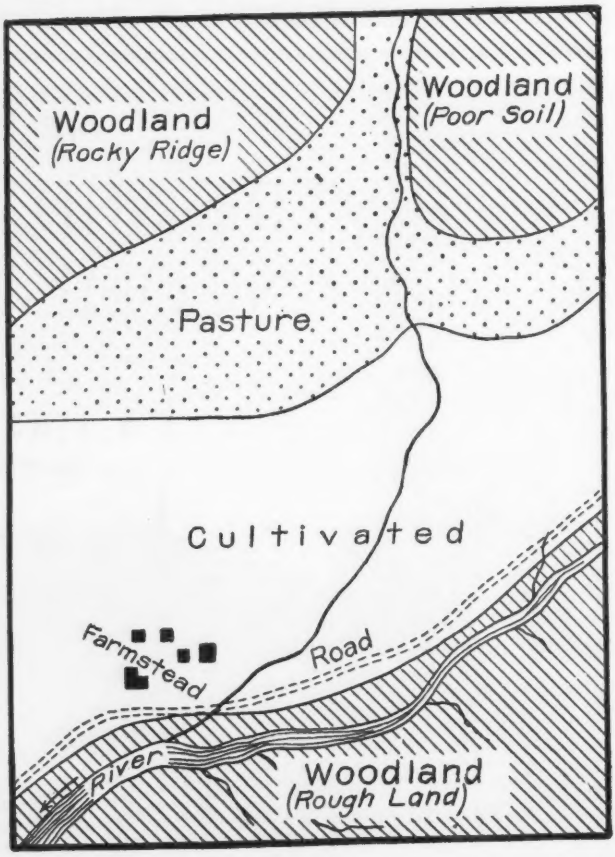

Woodland on the hills, pasture land on the slopes, and cultivated land below

Washington, D.C.

Issued August 1920
Revised August 1933
Slightly revised October 1937

FORESTRY AND FARM INCOME

By WILBUR R. MATTOON, *extension forester, Branch of Public Relations, Forest Service*

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WHY FARM FORESTRY PAYS

THE RIGHT HANDLING of forest trees on the farm will make it more prosperous, add to its comforts as a home, and enhance its value as an investment.

The home forest, in many sections of the country, will supply the timber which the farm needs for buildings, fences, fuel, repairs of all kinds, and many other uses; and there will often be a surplus which can be sold in the form of standing timber, saw logs, posts, poles, crossties, pulpwood, fuelwood, and blocks or billets for making spokes, handles, spools, boxes, barrels, and excelsior.

A well-cared-for home forest serves also as a windbreak for buildings, a shelter for livestock, a protection of valuable lands from erosion, a means of profitable employment for men and teams during otherwise spare or idle time, a place of recreation, and an improvement in the appearance of the farm.

Trees improve and build up the soil. The leaves, small twigs, and other tree litter decompose and form a layer of dark-colored vegetable mold, which enriches the soil and stores up soil moisture. By means of this layer of mold, the binding of the soil by the roots of the trees, and the resistance of the trunks to the rapid flow of water, the woods prevent floods from gullying or destroying the land by erosion, particularly on steep slopes.

Even if a farmer sells no timber the woodland pays. The firewood, fence posts, and material for repair and construction on the farm, the time and money saved by having them conveniently on hand, and the protection against extremes of weather afforded the crops, farm buildings, and stock are worth considerably more than the trouble and expense of raising and caring for the trees.

The woods need not occupy good farm land that will grow other crops. Trees are, as a rule, grown on the less fertile, stony, thin, or poorly-drained soils and on steep slopes. Unused corners and

small uncultivated spots about the farm are good places for rapid-growing, useful trees. The chief economic reason for timber growing on the farm is to get a money return from those portions which would otherwise be unproductive.

Though the land on which the farm forest is situated may not be suitable for other crops, it should not be treated as waste land (fig. 1). By comparatively little care it can be made to produce timber of value. Only a little attention is required, and this may be given in the winter or when other farm work is slack. Many trees that used to have slight value, and even small trees that used to be counted as brush to be got rid of, are now generally used for commercial purposes.

A permanent woodland is an essential part of a well-equipped farm; and more than ever before farm woodland has become a valuable asset convertible into money.

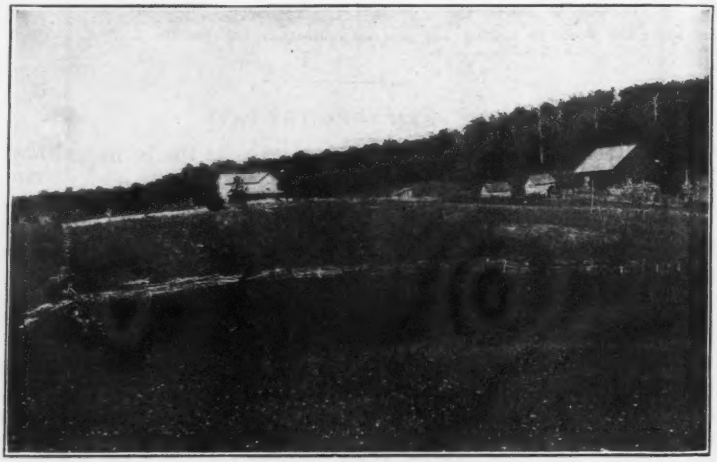

FIGURE 1.—Timber for the farm and for market, and shelter for the farmstead from woodland covering a stony ridge.

EXTENT OF FARM WOODLANDS

About one third of all the forest land of the United States is on farms. According to the 1935 census figures (table 1), this means that the farm woodlands amounted in all to about 185,000,000 acres. This is equivalent, roughly, to the aggregate area of New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, Ohio, Illinois, and Kentucky. If placed contiguously, they would form a solid strip 100 miles in width reaching from New York to a point one third the way across California.

The total woodland on farms east of the Rocky Mountains (fig. 2) amounts to 133,000,000 acres, or 89 percent of the total in the country. It covers an area as large as the entire forest lands of nearly all central and western Europe, including France, Germany, Switzerland, Austria, Denmark, Belgium, Netherlands, Poland, Czechoslovakia, Spain, Portugal, and Italy.

TABLE 1.—*Farm-woodland information, by regions and States, January 1935*

Region and State	Farm woodland area [1]	Farms [1]	Average woodland per farm (basis: all farms) [1]	Total land in farms [1]	Portion of farm in woodland [2]	Portion of forest land in State in farm woodland [1]	Increase in farm woodland last 5 years; [1] 1935 over 1930	Value of all farm-timber products in 1929 [2]
New England:	*Acres*	*Number*	*Acres*	*Acres*	*Percent*	*Percent*	*Acres*	*Dollars*
Maine	2,427,638	41,907	58	4,721,842	51.4	16.7	186,728	7,913,650
New Hampshire	1,273,826	17,695	72	2,115,548	60.2	28.3	201,825	3,063,363
Vermont	1,671,046	27,061	62	4,042,658	41.3	50.9	167,365	4,905,080
Massachusetts	1,027,724	35,094	29	2,195,714	46.8	31.4	165,155	2,981,126
Rhode Island	148,541	4,327	34	307,725	48.3	53.1	26,952	330,776
Connecticut	990,150	32,157	31	2,079,933	47.6	62.3	390,745	1,688,410
Middle Atlantic:								
New York	4,022,490	177,025	23	18,685,741	21.5	33.5	388,251	16,259,744
New Jersey	355,702	29,375	12	1,914,110	18.6	17.8	76,810	735,277
Pennsylvania	3,665,540	191,284	19	15,855,343	23.1	27.7	302,225	7,679,546
East North Central:								
Ohio	3,158,882	255,146	12	22,857,692	13.8	67.7	385,253	5,740,367
Indiana	3,064,187	200,835	15	20,518,745	14.9	88.4	444,707	5,375,846
Illinois	3,122,783	231,312	14	31,661,205	9.9	96.9	381,027	4,557,100
Michigan	3,816,124	196,517	19	18,459,922	20.7	18.6	581,386	8,801,817
Wisconsin	6,511,767	199,877	33	23,459,203	27.8	37.4	806,375	16,925,577
West North Central:								
Minnesota	5,383,250	203,302	26	32,817,911	16.4	24.6	636,947	10,756,988
Iowa	2,312,244	221,986	10	34,359,152	6.7	97.8	98,740	5,225,950
Missouri	8,902,997	278,454	32	35,054,542	25.4	50.6	1,202,997	11,850,371
North Dakota	575,435	84,606	7	39,118,136	1.5	99.0	17,693	486,550
South Dakota	635,709	83,303	8	37,101,871	1.7	32.9	145,152	544,705
Nebraska	934,237	133,616	7	46,615,762	2.0	85.6	−5,982	1,408,528
Kansas	1,233,036	174,589	7	48,009,770	2.6	98.0	123,530	2,306,529
South Atlantic:								
Delaware	234,511	10,381	23	921,251	25.5	72.2	30,813	419,876
Maryland	1,263,948	44,412	28	4,383,641	28.8	56.9	50,845	2,270,018
Dist. of Columbia	417	89	5	2,801	14.9	------	−62	449
Virginia	7,670,354	197,632	39	17,644,898	43.5	50.7	975,198	12,028,661
West Virginia	3,570,151	104,747	34	9,423,655	37.9	35.9	441,601	4,070,330
North Carolina	10,094,743	300,967	34	19,936,307	50.6	47.9	1,768,309	15,184,145
South Carolina	5,690,873	165,504	34	12,329,958	46.2	45.0	1,788,338	5,824,378
Georgia	11,675,369	250,544	47	25,296,522	46.2	50.7	3,302,432	8,861,877
Florida	2,611,295	72,857	36	6,048,406	43.2	11.1	719,457	1,262,546
East South Central:								
Kentucky	5,421,246	278,298	19	20,698,510	26.2	51.5	624,620	6,662,901
Tennessee	6,206,217	273,783	23	19,085,837	32.5	43.6	792,870	13,021,166
Alabama	8,247,231	273,455	30	19,660,828	41.9	38.0	1,761,250	8,504,708
Mississippi	7,562,659	311,683	24	19,655,413	38.5	40.7	1,338,350	9,280,785
West South Central:								
Arkansas	6,527,466	253,013	26	17,741,627	36.8	29.5	1,084,211	7,769,391
Louisiana	3,427,431	170,216	20	10,444,288	32.8	18.0	768,318	3,231,438
Oklahoma	4,846,755	213,325	23	35,334,870	13.7	41.0	787,262	2,829,834
Texas	25,135,727	501,017	50	137,597,389	18.3	89.2	9,446,244	8,440,281
Mountain:								
Montana	1,773,877	50,564	35	47,511,868	3.7	8.6	−46,029	964,202
Idaho	951,281	45,113	21	9,951,661	9.6	4.2	91,373	938,979
Wyoming	596,015	17,487	34	28,161,911	2.1	7.1	80,372	279,396
Colorado	1,759,005	63,644	28	29,978,472	5.9	8.6	217,542	524,553
New Mexico	2,131,666	41,369	52	34,397,205	6.2	10.9	213,532	403,432
Arizona	1,123,684	18,824	60	14,018,540	8.0	10.9	213,532	382,006
Utah	219,857	30,695	7	6,239,318	3.5	2.6	28,521	35,749
Nevada	89,254	3,696	24	3,621,769	2.5	.8	22,881	53,056
Pacific:								
Washington	2,354,168	84,381	28	14,680,097	16.0	10.6	479,928	3,262,215
Oregon	3,349,944	64,826	52	17,357,549	19.3	11.1	227,729	3,908,087
California	5,706,513	150,360	38	30,437,995	18.8	19.8	1,203,758	2,090,486
Total or average	185,474,965	6,812,350	27	1,054,515,111	17.59	30.07	35,530,240	242,042,245

[1] 1935 census.
[2] 1930 census was the last to give these values.

The average acreage of woodland on farms in the United States is about 27 per farm. This amount varies widely, however, in the different sections of the country, ranging from 48 acres in New England to 17 in the West North Central States (table 2).

Farms contain more than one half the entire hardwood forest lands of the United States. On the farms of this country the woods occupy a larger portion of the total land area than any other crop; in fact as much as all the cereal crops combined.

In the New England States more than 20 percent of all forested lands is on farms, and in Ohio, Indiana, Illinois, and Iowa from 70 to 97 percent. In the Southern States the farms contain almost one half of all the forest lands, or a total of more than 110,000,000 acres. In Maryland, Virginia, Georgia, Kentucky, and Texas more than 50 out of every 100 acres of forest land is on farms.

Information concerning the areas of farm woodland, percentages of farmland wooded, total number of farms, and other subjects will be found by States in table 1 and by regions in table 2.

FIGURE 2.—Important farm woodland area east of the Rocky Mountains.

TABLE 2.—*Farm-woodland information by regions*

Region	Total woodland on farms	Average woodland on farms (basis: all farms)	Portion of farm in woodland	Farms	Total land in farms
	Acres	*Acres*	*Percent*	*Number*	*Acres*
New England (Maine, N. H., Vt., Mass., R. I., Conn.)	7,538,925	48	48.8	158,241	15,463,420
Middle Atlantic (N. Y., N. J., Pa.)	8,043,732	20	22.1	397,684	36,455,194
East North Central (Ohio, Ind., Ill., Mich., Wis.)	19,673,743	18	16.8	1,083,687	116,956,765
West North Central (Minn., Iowa, Mo., N. Dak., S. Dak., Nebr., Kans.)	19,976,908	17	7.3	1,179,856	273,077,144
South Atlantic (Del., Md., D. C., Va., W. Va., N. C., S. C., Ga., Fla.)	42,811,661	37	44.6	1,147,133	95,987,439
East South Central (Ky., Tenn., Ala., Miss.)	27,437,353	24	34.7	1,137,219	79,100,588
West South Central (Ark., La., Okla., Tex.)	39,937,379	35	19.9	1,137,571	201,118,174
Mountain (Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.)	8,644,639	32	5.0	271,392	173,880,744
Pacific (Wash., Oreg., Calif.)	11,410,625	38	18.3	299,567	62,475,661
Total or average	185,474,965	27	17.59	6,812,350	1,054,515,111

VALUE OF WOODLAND PRODUCTS

Considerable income may be derived from the home forest. The total value of forest products taken from timbered land on farms reported in the 1930 census, and shown in table 3, was $242,042,245.[1] Over half of this represents the value of wood and various minor wood products used on the farm and the rest the value of the products sold, or cut and held for sale. For the farms reporting (2,558,899, or 40.7 percent of all the farms), this amounted to an average of about $95 per farm.

The value of the various forest products cut yearly on farms in New England amounted to nearly $21,000,000. The same item for the 14 Southern States from Maryland to Oklahoma and Texas makes a total yearly value of over $105,000,000. Each of 7 States reported more than $10,000,000 as the value of forest products cut on their farms, as follows, beginning with the highest: Wisconsin ($16,925,577), New York ($16,259,744), North Carolina ($15,184,145), Tennessee ($13,021,166), Virginia ($12,028,661), Missouri ($11,850,371), and Minnesota ($10,756,988). They were followed by Mississippi, Georgia, Michigan, Alabama, Texas, Maine, and Pennsylvania, each of which cut forest products worth more than $7,000,000.

Saw logs and veneer logs, crossties, poles and piling, fence posts, pulpwood, and fuel wood are the chief timber products cut on farms (table 3). Nearly 41 (40.7) farms out of every 100 in 1929 (according to the 1930 census) cut some timber products. Fuel wood is an important item. In 1929 an average of 14 cords was cut per farm reporting, or a total for the country of 34,100,529 cords. Piled continuously, this would reach twice around the world at the equator

TIMBER GROWING IN THE EASTERN PART OF THE UNITED STATES PAYS BECAUSE—

1. There is plenty of cheap land unfit for agriculture.
2. The abundant rainfall permits rapid tree growth.
3. Transportation facilities by rail and water are good.
4. Numerous large cities furnish a market.
5. The region is far removed from the virgin supplies of the Pacific Northwest.

[1] The latest census values. These items were not included in the 1935 census.

and overlap for a distance of 1,600 miles. The total value was $151,245,458. Fence posts are essential on the farm, and the farmers cut 98,664,249, or an average of 174 per farm. The saw logs and veneer logs cut on farms in 1929 amounted to a total of 5,000,000,000 board feet. The value of this material at the farm was $47,637,752. Farms produce relatively smaller amounts of saw timber and more of the total cut of fuel wood, posts, crossties, and pulpwood.

TABLE 3.—*Quantities of various timber products cut on farms and their total values, by regions* [1]

Region	Kind of timber product						Value of all products
	Saw logs and veneer logs	Fuel wood	Pulpwood	Posts	Crossties	Poles and piling	
	Board feet	*Cords*	*Cords*	*Number*	*Number*	*Number*	*Dollars*
New England [2]	409,252,000	1,534,323	286,889	1,468,516	341,349	73,604	20,882,405
Middle Atlantic [2]	255,585,000	2,771,188	79,522	9,382,626	911,863	406,226	24,674,567
East North Central [2]	375,540,000	5,211,268	209,153	16,731,088	1,504,810	233,578	41,400,707
West North Central [2]	260,909,000	4,557,450	163,700	25,263,432	1,564,757	236,258	32,579,621
South Atlantic [2]	1,579,573,000	7,881,673	398,631	8,512,614	2,961,920	986,297	49,922,286
East South Central [2]	1,409,725,000	6,241,856	161,882	12,571,457	3,634,212	549,763	37,649,560
West South Central [2]	359,713,000	4,356,687	124,324	19,579,414	3,842,006	348,494	22,270,944
Mountain [2]	59,784,000	406,370	7,253	2,428,843	234,501	244,314	3,581,373
Pacific [2]	332,845,000	1,149,714	54,405	2,726,259	343,368	219,881	9,260,788
Total quantity	5,042,926,000	34,110,529	1,485,759	98,664,249	15,338,786	3,298,415	
Total value..dollars	47,637,752	151,245,458	11,364,389	15,316,161	10,000,642	6,477,843	242,042,245

[1] Values by States are shown in table 1.
[2] For names of States included, see table 2.

Census of 1930.

SECURING GOOD FOREST GROWTH

At present farm woodlands are yielding, as a rule, only from one third to one half the wood they could grow. This is because only a few farmers realize the possibilities in their woodlands and give them proper care. As a result the home forest, which is close at hand, where comparatively little attention each year in protecting, cutting, and utilizing the timber would be very profitable, is in poor condition.

The amount of timber that an acre can grow in a year varies a good deal with the quality of the soil and moisture supply and the kind and number of the trees per acre. If fully stocked with trees and well cared for, an acre of hardwoods should grow yearly from about one half to one cord of wood and an acre of pine from one to two cords, a cord being equivalent to about 500 board feet of saw timber. Growth averages rather less in the northern part of the country because of the shorter season and somewhat more in the warmer southern part.

The chief essentials in keeping the trees growing are excluding fires and allowing the humus to collect on the forest floor. Large openings in the woods reduce the annual yield of timber and should not be allowed to occur. The length of time required to reach merchantable size varies with the kind of tree and the use to which its wood is to be put. Posts and crossties of some kinds may be grown in from 10 to 30 years, and most kinds of quick-growing trees will be large enough for saw timber in from 20 to 40 years.

After logging, a new stand of young trees generally starts naturally from seeds or sprouts from stumps. The natural seeding process in the woods can be helped by turning hogs into the woodland before the seed falls, or by harrowing the ground or conducting logging operations in a good seed year just previous to or shortly after

WOOD INSURES WINTER JOB

A farmer, settling on a quarter section of cut-over timberland in northern Wisconsin, reserved 70 acres for permanent woodland and cleared the rest. The natural timber was pine, spruce, and fir. After a few years he began cutting timber carefully, always leaving the thriftiest and best to grow. This was winter work for him and his sons.

During a period of 31 years he has kept a record of the amount of timber cut and the money received for it. The timber cut has amounted to 700,000 board feet of saw logs, which has brought him in an average gross return of $500 in cash yearly. Yet by his good management and cutting, the land at the end of the period (1932) has about 275,000 feet of standing timber.

The owner, in speaking of his forestry operations, admits that his woods have often been a source of temptation to him. "Many times in those earlier years", he said, "when cash was needed badly I was tempted to sell all the timber in one lump. But I did not do it. I knew that if I held on to my timber there would always be a winter job and some cash coming in. I am glad today that I never let it go."

the seed falls. By these means, the soil is stirred up, the seeds come in contact with it, and germinate more readily.

Some points to be remembered about trees which sprout are (1) the most thrifty sprouts come from clean, well-cut stumps felled during the late fall, winter, or very early spring before the sap begins to flow; and (2) the top of the stump should be cut smooth

so as to shed water. Trees which sprout successfully include such hardwoods as the oaks, hickories, chestnut, basswood, gums, cottonwood, and willows, and young shortleaf and pitch pines.

PINE POLES FROM AN OLD POTATO PATCH

A young man from Nebraska moved on to a small, poor, sandy-land farm in southern Mississippi. Two acres of abandoned land, worn out in growing potatoes and watermelons, came up in longleaf pine saplings. This "brush", as the neighbors called such patches, meant more to this young farmer from the treeless plains than to the local residents, and he protected the young trees from fire. Later when the neighbors, in a friendly spirit, advised him to cut and burn his saplings in order to avoid the State tax on growing timber he refused to take their advice.

The young trees grew rapidly under protection, and the land became covered with a crowded stand of tall, straight poles. One day a timber buyer came along the sandy road. He looked over the stand, which he found contained more than 1,000 merchantable poles, and offered the owner $600 for the standing trees. This was more "cash money" than the farmer had seen at one time in many years, and he gladly closed the deal at the buyer's figure, although at current stumpage prices the timber was worth considerably more money.

With no expense for labor or fertilizer, the farmer's timber crop yielded him a good net profit averaging $5 an acre yearly for a period of 35 years.

Woodlands may also be restocked with young trees by planting out small seedlings grown in nursery beds or dug up in the woods, or under some conditions by sowing the tree seeds. If trees are

to be planted, it is well to select those native to the region which grow most rapidly and produce the most useful kinds of wood (fig. 3).

NUMBER OF TREES IN GOOD NATURAL STANDS

Often the question is raised as to how many trees there should be in a well-stocked natural stand, namely, one that is not too dense or too open. The number varies with the prevailing sizes or diameters of the trees and also with the kind, or species, of tree. Table

FIGURE 3.—Thrifty woods, good crops, and a happy farmer.

4, for example, shows the number of trees of different diameters and the total number of trees per acre for stands of four different groups or ranges of tree diameters. This holds generally good for natural stands of a good number of different kinds of trees in the eastern part of the United States. Those which demand much light, or are intolerant, such as the ash, black walnut, and red pine, must have an abundance of light and usually consume more soil moisture, and there should be somewhat fewer trees of these kinds per acre. Likewise trees such as the sugar maple, beech, yellow birch, and white pine, which can tolerate considerable shade, might stand closer together.

IMPROVING THE WOODS BY CUTTING

When rightly handled, a stand of timber yields continuous or repeated harvests. It should be cut with an eye to its continuous production on the land. The aim should be to keep the land producing timber of the best quality at the fastest rate.

TABLE 4.—*Number of trees per acre of different sizes in well-stocked stands*[1]

Trees of like size		Number of trees of diameter—			
Diameter at breast height[2] (inches)	Number	2 to 10 inches	2 to 14 inches	6 to 18 inches	10 to 24 inches
2	2,000	400	300		
4	900	180	130		
6	510	105	75	75	
8	320	65	45	45	
10	235	50	30	30	30
12	170		25	25	20
14	130		20	20	16
16	100			15	12
18	85			12	11
20	75				9
22	65				8
24	55				7
Total		800	625	222	113

[1] Based on data compiled by the University of Michigan.
[2] Height of 4½ feet above the ground. Trees measured outside the bark.

Not all that is merchantable should be cut. In timber production on farms, it is not sufficient to leave only enough seed trees to restock the land. This would mean too long a wait between harvests.

TREES TO CUT FOR IMPROVING THE WOODS

Trees which are well suited for firewood and the removal of which will lead to an improvement of the remaining trees in the stand.

Trees which have been overtopped by others and have had their growth stunted.

Diseased trees, or trees seriously injured by insect attacks, or trees extremely liable to such injury; for example, chestnut in the region subject to blight or birch in the gipsy-moth area.

Badly fire-scarred trees.

Trees of the less valuable species, such as beech, birch, black oak, blackjack oak, or black gum, crowding the more valuable sugar maple, white or shortleaf pines, yellow poplar, or white oak.

Crooked trees and large-crowned, short-boled trees that will not make good lumber and that are crowding or overtopping others.

Slow-growing trees crowding fast-growing species of equal value.

Sound dead trees, both standing and down.

Mature trees that have reached their full growth.

There should always be plenty of younger trees as a good basis for growing later crops and also trees of larger sizes that can be cut at frequent intervals and keep up the cash income from timber.

Good management should result in a home forest fully stocked with sound, well-shaped trees of valuable and useful kinds that are growing as fast as possible. This can be brought about largely by "weeding", or cutting out the inferior kinds—the "weed" trees—for exactly the same reason that weeds are hoed out of the cornfield. The good trees need the light, space, soil moisture, and plant food that would otherwise be taken by the less valuable trees. Sometimes it becomes advisable to fill openings or improve the quality of the woods by planting seeds or seedlings of desirable kinds of trees.

FIGURE 4.—Woods improved by right cutting.

Dead and dying trees, diseased trees, deformed trees which shade out better ones, the less valuable kinds of trees, such as gray birch, aspen, blackjack oak, dogwood, sourwood, blue beech, ironwood, and others, and the less promising trees in crowded groups should be removed. The last operation is known as "thinning." By following these practices each year improvement in the forest is brought about in a relatively short time.

The wood removed in improvement cuttings often need not be a loss. It should be considered as an early crop that can be used or sold, generally at a price to show a profit on the work of thinning, while the woods are made more valuable by its removal (figs. 4, 5, and 6).

It is sometimes advisable to prune trees in forest stands, more especially in immature or younger stands of the more valuable kinds or in thrifty promising stands of any sort. The purpose is to clean the trunk of side branches, causing it to develop clear, high-grade

timber which commands higher prices. Such forest pruning began to be practiced first in New England with stands of white pine, where it has proved to be generally profitable. It is coming into good practice with farmers and other small owners in the Southern States on shortleaf, loblolly, slash, and longleaf pine; also on black

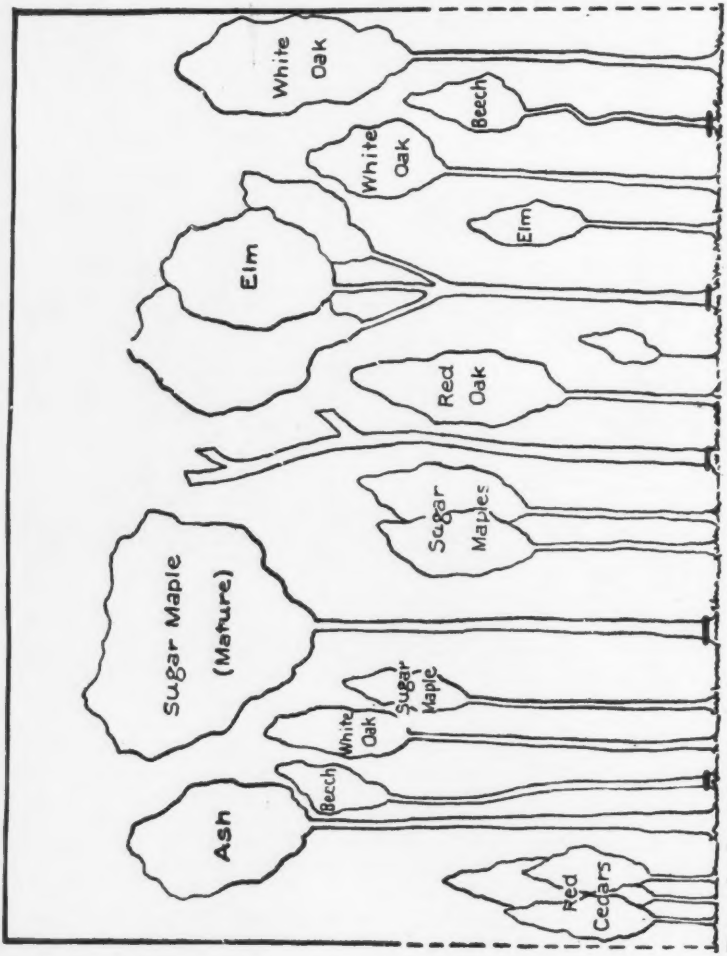

FIGURE 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species are marked at the base to be cut. A good stand will be left of thrifty undercrowned and promising young trees.

walnut, black locust, pine, and spruce forest plantations in the Central and Lake States.

Much more often than is commonly realized, grapevines and some other kinds of vines kill or stunt valuable trees, especially those that have rather open foliage like the black walnut, ashes, and locusts, and also trees standing in the open. The damage is caused by the

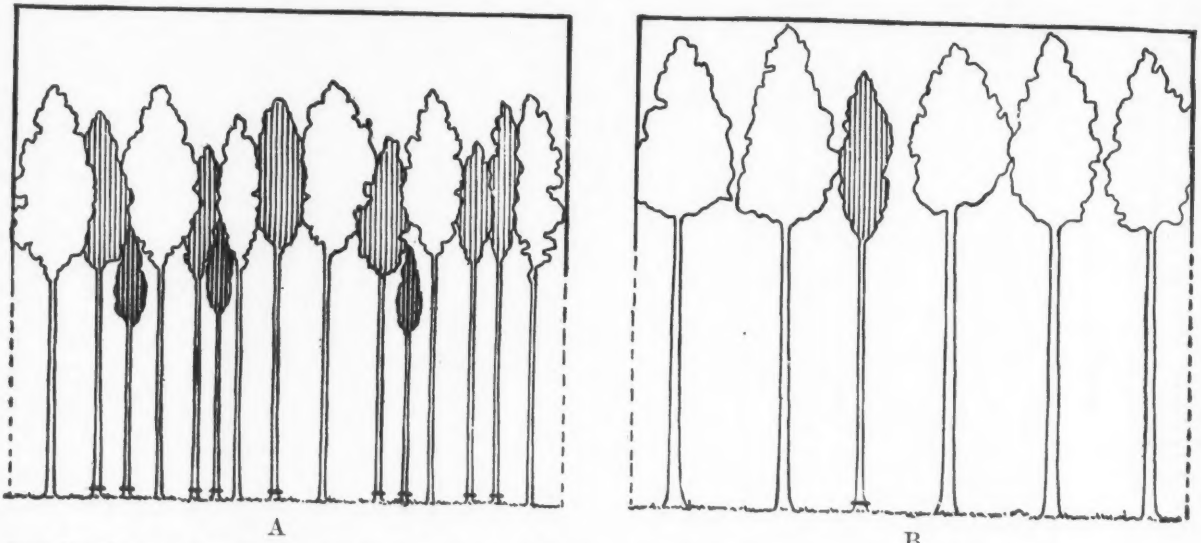

FIGURE 6.—The growth and value of pine are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber; A, before thinning—15 overcrowded trees (shaded trees to be cut); B, the same stand 5 years later, after thinning—6 larger and more valuable trees (shaded tree to be cut).

vines spreading their leaves above those of the tree, which are thus shaded out, and as a result the tree becomes sickly or dies. This is an insidious form of damage, which often escapes notice. Therefore, cutting the vines should not be overlooked or neglected.

GOOD LOGGING

The right use of the ax and saw and the protection of the land from fire are the keys to the growing of timber profitably and perpetually as a crop. This right use comes from good judgment in the selection of trees to be cut and in cutting and logging carefully. Lack of proper care in these two essentials of protection and cutting has resulted in the ruin of many pieces of valuable timber-producing land.

The trees to be cut should each be selected in advance and marked, preferably by the use of whitewash or a cheap white paint. Blazing the trunks with an ax causes wounds in trees, which sometimes are left standing for long periods before being cut. Mistakes made in marking trees with an ax are not so easily remedied as those made with a brush.

Cutting should be done so as to cause the least possible injury or destruction to other living trees, particularly young trees. In felling trees advantage should always be taken of natural openings in the woods.

Stumps should be cut low—12 inches or less in height—thus taking the best timber, which is usually in the base of the tree. Cases are known in which enough good-grade timber has been left in high stumps to have paid for the entire cost of the logging.

Logs should be cut well into the tops of the trees. The upper log or logs usually will yield only low-grade lumber, but it should be utilized.

Advantage should be taken of crooks to cut the ends of logs at crooks rather than between them.

All brush should be pulled away from living trees in logging to lessen the fire damage and, in southern pines, also the menace of infestation of beetles, or so-called "worms." Care against the outbreak and spread of fire is of extreme importance.

In getting logs out of the woods care should be used to avoid all unnecessary injury or damage to living trees, both young growth and mature trees. The healing of wounds is a slow process, and wounds in the bark are often serious as they freely admit infection of disease and the attack of insects.

ESTIMATING AND SELLING TIMBER

When timber is no longer growing at a profitable rate it should be cut and used or sold. A farmer who is ready to sell timber would profit by measuring his trees, estimating how much saw timber or other product they contain, and making inquiry to find out how much they are worth. If he does not know or cannot find out how to do this, he should employ some experienced and reliable person to estimate and value his timber for him.

The customary units of measure in selling farm timber are board feet, cords, linear feet, and the piece. A board foot, for example,

is 12 inches long, 12 inches wide, and 1 inch thick, or its equivalent. The standard cord of wood is 4 feet high, 4 feet wide, and 8 feet long. The linear foot is a measure of length only, without regard to the other dimensions of the material. Piece measure is only a count of the pieces in any form in which the wood is sold.

FIGURE 7.—Fast-growing hickory is in demand for implement handles and spokes.

Logs and standing trees are usually estimated in board feet. Saw timber is measured in board feet. Round timber, such as poles and piling, is usually sold by the linear foot. Firewood, pulpwood, and wood cut in short lengths for distillation, handle stock (fig. 7), and other uses are usually sold by the cord. Fence posts, ties, telephone poles, and some other forms of timber are sold by the piece.

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Saw timber in the standing tree is estimated by measuring the diameter of the tree, outside the bark, at breast height (4½ feet above the ground), and measuring or estimating the height of the tree. When these measurements are known, the contents of the tree can be found from a volume table.[1] Often the length of the part of the trunk to be used is taken in units, or number of 16-foot logs, instead of the total height of the tree.

A volume table is one showing in board feet the amount of timber that can be sawed from trees of given heights and diameters or from a given number of merchantable logs and diameters. For example, a volume table for white oak would show that a tree 18 inches in diameter (measured outside the bark at breast height) and having three merchantable 16-foot logs will saw out 286 board feet of lumber. Volume tables are made for different kinds of trees, each table based on the average of many measures of felled trees.

[1] For volume tables and other information on estimating and measuring timber, see Farmers' Bulletin 1210, Measuring and Marketing Farm Timber, or apply to State foresters. Price 10 cents.

TEN HELPS IN MARKETING WOODLAND PRODUCTS

1. Get a reliable estimate of the amount and value of the timber to be sold. If necessary get experienced help. Know what you want to sell.

2. Before selling, consult neighbors who have sold timber, and benefit from their experiences.

3. Investigate local timber requirements and prices. Your products may be worth more locally because transportation is saved.

4. Get prices for various wood products from as many sawmills and other wood-using plants as possible.

5. Advertise in papers and otherwise secure outside competition.

6. Secure bids, if practicable, both by the lump and by log-scale or other unit measure.

7. Be sure that you are selling to responsible purchasers.

8. Market the higher grades of timber and use the cheaper for farm purposes.

9. Remember that standing timber can wait over a period of low prices without rapid deterioration.

10. Use a written agreement in selling timber, especially if the cutting is to be done by the purchaser.

A saw log is measured by taking the length of the log and its diameter inside the bark at the small end, then employing a log rule to estimate the amount or number of board feet it contains. A log rule is a statement of the estimated number of board feet of lumber that can be sawed from logs of different lengths and sizes. A good rule for 12-foot logs is to multiply the diameter inside bark at the small end by half the diameter. For shorter logs the contents will be proportional to the length of the logs. Thus, a 12-foot log 16 inches in diameter will saw out about 16 × 8 or 128 board feet, while a 10-foot long log 14 inches in diameter will cut $\frac{10}{12}$ of 14×7, or 81⅔ board feet.

It is very important to consider what log rule is to be used, because much depends upon it in measuring and selling timber. There is a great difference in the amount of timber and likely often in the resulting money return.

The International rule (table 5) gives log volumes that closely approximate what can be sawed out by using good methods. Owners of small logs for sale will benefit when this or some equally close rule has come into general use.

TABLE 5.—*International log rule*

[The contents of logs in board feet, by using a circular saw, cutting ¼-inch kerf, and sawing carefully by good methods]

Diameter of log at small end and inside bark (inches)	Contents of log in board feet when length of log is—												
	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet	19 feet	20 feet
4	2	2	3	3	4	5	5	5	6	7	7	8	9
5	4	5	6	7	7	8	9	11	12	13	15	16	17
6	7	9	10	11	13	14	16	18	19	21	23	25	27
7	12	14	15	17	19	21	24	26	28	31	34	36	39
8	16	19	21	24	27	30	33	36	39	42	46	49	52
9	23	26	29	33	36	40	43	47	51	55	59	63	68
10	29	33	37	42	45	51	54	59	64	69	75	82	89
11	36	42	46	52	57	63	68	74	80	86	95	100	107
12	44	51	57	62	70	77	83	91	97	103	111	119	129
13	52	60	68	76	83	92	100	108	116	124	134	143	151
14	62	71	80	98	107	107	117	127	136	147	158	168	176
15	73	82	94	104	114	125	136	146	157	170	181	195	204
16	84	96	108	119	131	144	156	167	181	194	207	222	233
17	96	110	123	136	149	163	177	192	205	221	235	251	265
18	110	124	139	155	169	185	201	218	232	250	267	282	300
19	123	140	156	175	190	210	225	244	261	280	299	317	337
20	138	157	174	197	212	232	251	270	290	310	330	352	374
21	152	172	193	215	234	256	279	299	321	344	366	389	412
22	168	192	214	238	259	282	307	330	354	379	404	429	453
23	186	212	235	260	285	310	337	362	388	415	445	470	498
24	203	232	257	285	311	339	367	398	424	452	484	514	543
25	223	253	281	311	339	370	400	433	462	494	526	560	590
26	241	273	304	337	368	402	435	468	502	537	570	606	640
27	262	296	329	364	400	434	471	504	543	580	617	657	692
28	281	319	356	395	432	470	509	545	586	623	664	706	748
29	303	344	383	425	463	505	546	587	630	670	712	756	801
30	326	369	411	455	498	542	586	628	674	719	765	810	858

The Doyle rule (table 6), although very inaccurate for small-sized timber, is probably most commonly used in the United States. To determine the number of board feet in a log by this rule, deduct 4 inches from the diameter of the small end, then square one fourth the remainder and multiply the product by the length in feet.

For example, a log measuring 20 inches at the small end and 12 feet long contains 192 feet. The Doyle rule, in many sections the standard and in some States the legal rule, is unfair to the seller for measuring logs below 28 inches in diameter. In the early days of large cheap timber it was fairly satisfactory, but for small-sized timber it gives such low values as to make it unsatisfactory. The Scribner rule is fairer than the Doyle. Careful sawing, however, should result in 10 to 20 percent more lumber from second-growth timber than is credited by the Scribner rule.

TABLE 6.—*Doyle log rule*

Diameter of log at small end and inside bark (inches)	Contents of log in board feet when length of log is—												
	6 feet	7 feet	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet
6	1	2	2	2	2	3	3	3	3	4	4	4	4
7	3	4	4	5	5	6	7	7	8	8	9	10	10
8	6	7	8	9	10	11	12	13	14	15	16	17	18
9	9	11	12	14	16	17	19	20	22	23	25	27	28
10	13	16	18	20	22	25	27	29	31	34	36	38	40
11	18	21	24	28	31	34	37	40	43	46	49	52	55
12	24	28	32	36	40	44	48	52	56	60	64	68	72
13	30	35	40	46	51	56	61	66	71	76	81	86	91
14	37	44	50	56	62	69	75	81	87	94	100	106	112
15	45	53	60	68	76	83	91	98	106	113	121	129	136
16	54	63	72	81	90	99	108	117	126	135	144	153	162
17	63	74	84	95	106	116	127	137	148	158	169	180	190
18	73	86	98	110	122	135	147	159	171	184	196	208	220
19	84	98	112	127	141	155	169	183	197	211	225	239	253
20	96	112	128	144	160	176	192	208	224	240	256	272	288
21	108	126	144	163	181	199	217	235	253	271	289	307	325
22	121	142	162	182	202	223	243	263	283	304	324	344	364
23	135	158	180	203	226	248	271	293	316	338	361	384	406
24	150	175	200	225	250	275	300	325	350	375	400	425	450
25	165	193	220	248	276	303	331	358	386	413	441	469	496
26	181	212	242	272	302	333	363	393	423	454	484	514	544
27	198	231	264	298	331	364	397	430	463	496	529	562	595
28	216	252	288	324	360	396	432	468	504	540	576	612	648
29	234	273	312	352	391	430	469	508	547	586	625	664	702
30	253	296	338	380	422	465	507	549	591	634	676	718	760

In finding a buyer for his timber the owner should inquire of his neighbors who have sold, or at local sawmills, wood yards, wood-using factories, railroad stations, and telegraph and telephone companies. He should also advertise in the papers and write personal letters furnishing a brief description of the kind, quality, and amount of timber for sale, in order to awaken competition among local and outside buyers. Securing a number of bids for the same piece of timber will tend to develop the best market and increase returns. It is well to have a written agreement as to the manner in which the timber shall be cut, and the amount and form of payment [2] (fig. 8).

Some of the industries buy their supplies largely or wholly in the log; hence, in many cases it will pay the farmer to look up these special markets for his logs, bolts, poles, ties, etc. Industries buying their supplies more or less generally in the form of round timber are manufacturers of handles, cooperage, veneer, woodenware and novelties, shuttles, bobbins and spools, vehicle stock, athletic goods, and pulpwood. Poles are purchased by electric-lighting, power, and tele-

[2] For further information see Farmers' Bulletin 1210 (price 10 cents), or apply to your State forestry agencies.

phone companies. Markets for piling will be found by applying to railroads, wharf, bridge, and bulkhead contractors in the larger towns and cities. For prices on ties, consult the nearest local railroad station agent. Cordwood is used by brickmakers, bakeries, limekilm operators, and fuel dealers in towns.

FIRE PROTECTION

The forest must be protected. Fire, careless logging, tree diseases, insect pests, and, in the hardwoods, grazing are the principal sources of injury.

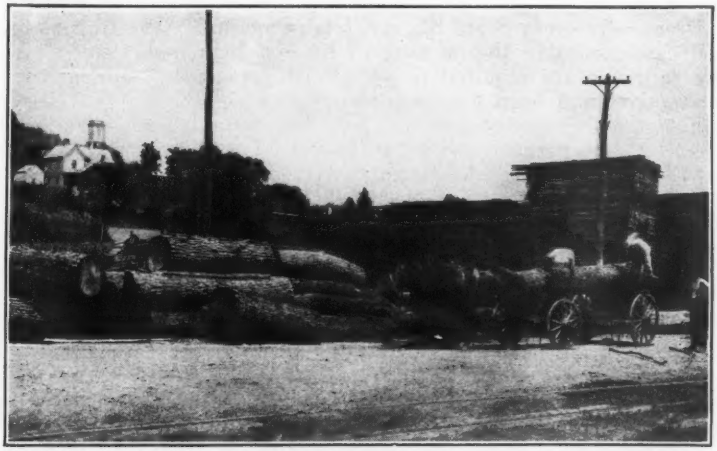

FIGURE 8.—Choice logs bring high prices and are often shipped long distances

Fire kills the little trees and weakens full-grown trees so that they may become diseased or infested with insects. It also destroys the humus cover of leaves and twigs that ordinarily protects the trees against summer drought and heat, conserves water for the springs and streams, and enriches the soil by adding nitrogen.

HELP PREVENT WOODS FIRES

BE SURE your match is out before throwing it away.
DON'T throw away burning tobacco.
CHOOSE a safe place and make your camp fire small.
PUT OUT your fire with water and then cover it with earth.
DON'T make large brush heaps. Choose a still day for burning, and plow furrows to protect near-by woods.

BE CAREFUL WITH FIRE

Dead trees and tops cut in logging are a fire menace and should, if possible, be utilized. Saw logs or firewood can be made out of the dead trees, and the unused large tops should be lopped so that they will lie close to the ground and rot quickly.

Some idea of the prevalence of fires in the United States east of the Rocky Mountains may be formed from the fact that here occur 90 out of every 100 forest fires. For the 5 years of 1926 to 1930, inclusive, an average of 145,448 fires yearly in this region burned over 39,948,304 acres of land and caused an enormous property loss. While fires were reported from all States, a greater number of fires occurred in the southern pine district than in any other important forest region.

Practically every State has strict laws against the setting of fire and carelessness in the burning of brush. In a number of States the railroads are required to use efficient spark arresters in their locomotives and burn fire lines along their rights of way.

Forest fire protective systems have been established by many of the States cooperating with the Federal Forest Sevice under the provisions of the Clarke-McNary Act. Patrolmen are employed who travel through the districts where there is danger of forest fires, watch for fire, and educate the public in the need for care in preventing fire and for getting quickly to any fire that may occur. Owners of woodland should get in touch with the State foresters and fire patrolmen, and secure their cooperation and assistance in keeping down fire hazard and damage.

GRAZING AND INSECT DAMAGE

Horses and cattle eat and break down young trees and pack the ground hard. Sheep and goats destroy large numbers of small trees by eating them. Hogs root up the ground, digging up the young trees and roots and sometimes eating the roots. They also prevent young trees from starting by devouring the nuts and other seeds from which they grow. On the other hand, however, trees bearing small or unpalatable seeds often start well after hogs have rooted up the leaf litter and soil.

Some people fear that good pasture will be wasted by keeping stock out of the woods. This is hardly true, since a fully stocked woodland has little or no grass in it, for the reason that there is insufficient light (fig. 9). Studies in farm management in northwestern Pennsylvania show that an open stand of trees, such as occur in average wooded pastures, reduces the pasturage value of the land as much as 65 to 70 percent.[3] Grass in the woods is a sign that the stand is in poor condition and that the trees are too far apart for growing a good quality and large amount of timber. This does not apply in the southern longleaf pine region or in some of the western forests, where much good timber occurs in open stands. Grass grown under the shade of trees is less nutritious than that grown in the open, so its actual food value is small.

Plenty of shade for livestock should be provided in pastures, but pasture land and woodland are most profitable when managed separately, each for the growing of its own individual product.

[3] Agriculture Bulletin 853, The Organization and Management of Farms in Northwestern Pennsylvania. (Price 10 cents.)

Woodland may be guarded against serious insect damage and disease by removing dead or dying trees and all those showing signs of insect attack or decay. In the South, pine should be cut in the cool part of the year. When it is cut in the summer, bark beetles and wood borers injure the cut trees, multiply rapidly, and spread to living trees, which they often kill by eating the rich inner bark for food. A special treatment for weevil-infested white pine has been developed. In cases of insect menace or injury it would be best to get into communication with the Bureau of Entomology, United States Department of Agriculture, or the State entomologist.

FIGURE 9.—Little or no grass grows in a fully stocked woodland.

USING TIMBER AT HOME

Lack of knowledge of the proper use of timber is one form of farm mismanagement.

It is a mistake to saw up choice logs of white oak, ash, cherry, and yellow poplar for rough uses at home, or to use clear black walnut for gate boards, or split up white oak butts for fence posts (fig. 10). Many valuable logs go into crossties, when they would bring the owner much more if sold as saw logs. Large numbers of young, rapid-growing trees, producing only one small tie, are cut, which, if left to grow for from 3 to 5 years, would more than double the profit.

Cutting is commonly done promiscuously without regard to continuing the future productiveness of the woodland, and large amounts of timber are commonly wasted in high stumps and long tops.

The importance of the home forest as a reserve for "pinch" times cannot be overestimated. In the period of business reorganization beginning in about 1930, for example, communities and individual farms having local supplies of standing timber were in a favorable condition since lumber, pulpwood, ties, poles, and especially fuel wood, kept moving although in restricted amounts. Farmers with

such supplies also had materials for repair of farm buildings and necessary new construction.

Timber that is cut in the late spring and summer months should be handled with special care to avoid injury. This is because freshly cut wood is then more likely to be attacked by insects and fungi than during the cold part of the year. Seasoning also proceeds more rapidly during the warmer season and may cause excessive checking. If rightly handled, posts, poles, and logs may be cut at any season without their durability being affected. In no case should wood be allowed to lie in direct contact with the ground. The opportunity for insect attack and decay can be reduced to a minimum by peeling

FIGURE 10.—Because they split easily, clear white oak butt logs have been worked up into fence posts when several farmers could have jointly shipped a carload at fancy prices.

the timbers and open-piling them off the ground in a shaded but dry place. This, however, does not retard checking of the wood.

Logs are sometimes stored under water in the hot season to prevent blue stain, checking, insect attack, and decay. Painting the ends of logs with a yellow ocher or barn paint will very materially retard injury by end checking. Painting peeled timbers with creosote will prevent sap stain and decay.

Well-seasoned fuel wood makes more heat and saves time and worry in the home. Thus a woodshed may be a good investment in more ways than in money saving.

TREATING FENCE POSTS

Every farm needs fence posts, but relatively few have sufficient supplies of lasting wood to meet home needs. This is particularly true in the Middle West and South. By means of a simple method of treating timber in open tanks with coal-tar creosote, the post and

pole problem can be readily solved. By this process such short-lived woods as soft maple, beech, birch, sweet gum, black gum, young or sap pine, and red oak are made durable for use in the ground for 10 to 30 years (table 7).

TABLE 7.—*Relative economy of treated and untreated fence posts* [1]

	Untreated sap pine	Untreated white or post oak	Creosoted sap pine
Cost of post	$0.05	$0.21	$0.08
Cost of treatment			.25
Cost of setting	.15	.15	.15
Total cost of post in ground	.20	.36	.48
Average life of post	[2] 2	[2] 6	[2] 15
Average yearly cost	0.10	0.06	0.03⅓
Average yearly cost of 1 mile of fence (posts 1 rod apart)	32.00	19.20	10.24

[1] The costs of materials and labor should be regarded as showing relative rather than absolute values.
[2] Years.

The treating of fence posts is an unusually favorable project for cooperation on the part of several farmers. This refers especially to buying equipment and supplies of coal-tar creosote.

A comparison of the annual costs of maintaining four fences built with posts of untreated sap pines, untreated white or post oak, treated white or post oak, and treated sap pine, respectively, indicates a saving of $8 to $23 per mile in favor of the treated pine.

Although more expensive at the outset, creosoted posts are generally more economical to use than many kinds of untreated, short-lived woods, because of their much greater lasting qualities. The exceptions would be in remote localities with cheap wood and labor and where it would be expensive to obtain creosote. The large saving in the replacement charges, which ordinarily mount up so high in maintaining a fence, and the use of cheap and inferior kinds of wood in the first place, much more than offset the increased cost of thorough treatment with creosote (fig. 11). Treated posts are a good investment, and their use where lasting woods are scarce or expensive is a sign of sound judgment in farm management.

Cutting and seasoning.—It is important that the timber be peeled and thoroughly seasoned before an attempt is made to treat it. Small flakes of inner bark left on the wood prevent proper absorption of the preservative at those places. Peeling is done most easily during the spring months, but is carried on at other seasons of the year. The posts to be treated should be peeled from 3 to 4 months, depending upon the weather, before treatment, and open-piled in a dry situation to effect proper seasoning.

Kinds of posts.—Because they have a uniform absorbing surface of sap wood, round sticks are more satisfactory than split timber for treatment. It is not profitable to treat lasting woods, such as red cedar, black locust, chestnut, and white oak. Practically all of the softwoods or sapwoods may be treated and profitably used as posts.

Small-sized timber.—When treated timber is used it is not necessary to cut the large-sized line posts commonly employed untreated in the past. A post from 2 to 3 inches in top diameter, long enough

to allow only a few inches above the top wire, costs less for creosoting and labor in handling, lasts as long as larger-sized timber, and possesses ample strength for ordinary fences. Small-sized trees are abundant in second-growth timber, often being crowded out by more vigorous neighboring trees. Cutting these for fence posts utilizes the forest product that would often otherwise be wasted, improves

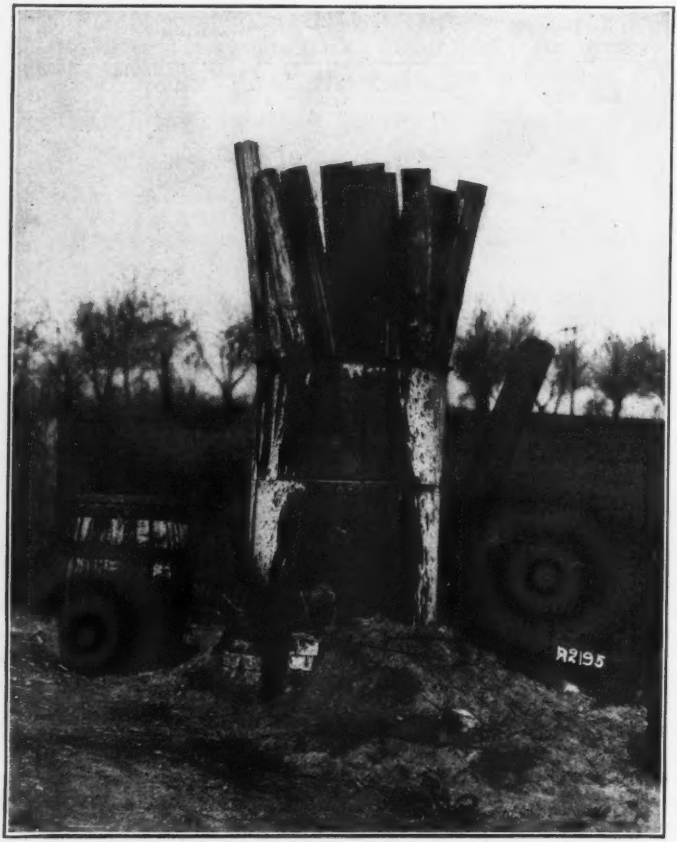

FIGURE 11.—The treating of nondurable timber brings many kinds of wood into new forms of utilization. (Photo by courtesy of Iowa State College of Agriculture.)

the remaining stand, and furnishes profitable employment on the farm during slack time.

Kind of treatment.—The application of creosote by brushing over the whole post is only slightly effective in preventing decay, and rot often starts in small cracks which are not reached by the brush, or in checks which soon develop while the post is in use. Open-tank treatment with a hot bath followed by a cold bath is recommended for fence posts. The sapwood surrounding the heartwood takes treatment readily and is thereby protected against the entrance of decay.

Preservative.—It is important to use a good preservative, and coal-tar creosote has been found to be by far the most satisfactory material. Ordinary gas tar or coal tar has been used more or less, but it is usually too thick even when treated to give a fair degree of penetration.

Treating.—The best treatment is that which results in the deepest penetration into the wood with the least absorption of creosote. The butts of the posts should be placed for 1 to 2 hours in creosote heated to a temperature of 180° to 220° F. It is important to treat the wood to a height of a foot above the proposed ground line. In the Southern States the entire post should then be submerged into cold oil, 80° to 100°, for 1 to 2 hours, or for such time as is necessary to get a good penetration. In the North, where decay is less rapid, the cold treatment is applied usually to the butts only, the tops being treated by painting or dipping in creosote.

A satisfactory outfit for treating posts successfully consists of an upright cylindrical tank for the hot treatment and a horizontal rectangular tank for the cold bath.

A saving in cost can be made by two or more farmers joining together in the purchase and use of treating tanks. In a number of instances this has proved to be a successful form of cooperation.

PLANTING FOREST TREES

The profitableness of forest planting cannot be laid down by any rule, since it is subject to very wide variation. Rapid-growing trees of good, standard value can often be grown profitably by farmers on portions of worn-out or idle lands or as a commercial enterprise on cheap lands located relatively near good markets. Examples may be cited of white and red pines in New England, black locust and black walnut in many districts of the eastern part of the United States, and shortleaf, loblolly, longleaf, and slash pines in the Southern States.

White pine, especially when planted in mixture with hardwoods, and red pine are among the most promising crops for large areas of the Northeastern States. The largest known reforestation operation undertaken by an individual private landowner is one carried on in the upper portion of the Hudson River in eastern New York, where one owner has planted about 5,500 acres, using a total of 5,473,600 small trees, mostly white, red, and Scotch pines and Norway spruce. In the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, Minnesota, and elsewhere the white pine blister rust is present, and planters of white pine should protect it from this disease by destroying all wild and cultivated currants and gooseberries within 900 feet of the plantation. These bushes are the alternate hosts of the blister rust and if they are permitted to remain near native or planted white pines in localities where the blister rust is prevalent the trees become diseased and gradually die. Usually the cost of uprooting wild currant and gooseberry bushes is small.[4]

Large areas of fine young forest stands have been established in the South by setting out 1-season-old seedlings of the four important

[4] For further information relative to protection from blister rust consult your State forester or the Bureau of Plant Industry, U.S. Department of Agriculture.

RETURNS IN GROWING TIMBER IN NEW HAMPSHIRE

This white pine was planted on an abandoned sidehill pasture of about 3 acres in New Hampshire. At the age of 44 years (shown in the illustration) it contained about 90,000 board feet of lumber. The total outlay at the time, counting the value of the land and labor of planting, was $35. The timber was worth on the stump something over $1,500.

The farmer had this strip of practically worthless sidehill, and with some spare time on hand dug up 1,400 seedling pines growing in a thicket and set them out. About 20 years later the farmer died and among his assets was this small tract of young pine for which, much to her surprise, the widow was offered $300. The second owner retained it for about 15 years and then, wishing some money, sold it. Soon afterwards it came into the hands of the third owners, a lumber company, for something over $1,000.

Assuming a land value of $5 per acre, and a charge for taxes and oversight for the period averaging $2 per acre per year, the operation yielded a return of 5 percent on the total investment in land, labor, and annual outlay, and in addition a neat sum equivalent to a yearly net profit from the start of $2.34 per acre. To get this return required favorable markets.

kinds of pines. The largest such young planted forest is located in southeastern Louisiana, where a lumber company has planted 30,000 acres. Hundreds of farmers in the South are turning worn-out farm lands into timber production by planting yearling pines. In the piedmont the pines are mostly the shortleaf and loblolly, and in the lower piedmont and Coastal Plain they are the slash and longleaf pines. Both of the latter trees yield crops of crude turpentine, from which spirits of turpentine and rosin are produced. Owners often say that the return from the "gum" is double that obtained later from the timber.

Of the two trees, the slash pine is more extensively planted because of its very rapid growth when young and its heavy yield of gum or crude turpentine. One farmer in south Georgia has reforested about 2,000 acres of his worn-out cotton fields by planting slash pine seedlings at the rate of about 750 per acre, or a total of 1,500,000 trees.

In rich agricultural belts the planting of forest trees on a large scale for direct money returns would undoubtedly prove to be a losing investment. There, however, considerable forest planting goes on, but on relatively small, isolated tracts on farms and for special purposes, depending upon local conditions. Forest trees are planted chiefly to check soil erosion on slopes; to afford a windbreak as shelter for growing crops, livestock, and man; to produce Christmas trees; and to utilize to the best advantage rough, stony, or poor soils and inaccessible and wet lands. Black walnut is one of the best trees to plant in good soil over much of the region.

In western Tennessee, where the soil is a very deep, rich, clay loam, known locally as "brown loam", the planting of black locust trees has been extensively pushed by the State as a means of reclaiming and making profitable badly eroding lands and at the same time checking at the source of the small streams the silting which results in expensive dredging operations on the Mississippi River and its navigable tributaries. Similar conditions prevail over large areas in other States of the Mississippi Basin and in the piedmont and lower slopes of the Appalachians.

On the farms of the eastern part of the United States many thousands of acres of slopes, from which the forest should never have been removed, have been cleared and have become waste. Careful cutting by the selection method would have resulted in keeping the land continuously productive. This mistake is still going on in some rural sections where foresight and study have not yet been generally applied to farm management.

Forest-tree planting is practicable as a means of putting idle land to producing, checking soil erosion, regulating stream flow, and improving the quality of woodlands by increasing the quantity and value of their product. Through carelessness, cutting, fire, and other agencies, many woodlands have fallen far below their maximum capacity of production. By the application of a little intelligent guidance in making proper improvement cuttings and by affording protection from grazing animals and fire, it is often possible within the period of a few years to bring about a marked change for the better in the composition and quality of the woodland. This method

often succeeds even better than planting trees. This is illustrated by the experience of woodland owners. A progressive farmer in Summit County, Ohio, wishing to handle his woodlands rightly, excluded all livestock by fencing and at the same time planted catalpa in the larger openings in his woods. In 10 years the forest floor, instead of being bare and packed hard, consisted of a deep layer of spongy organic matter, affording protection to the roots of the trees. A complete understory of young yellow or tulip poplars, hard maple, beech, elm, white oak, hickory, and ash had sprung up. The volunteer poplars had grown to from 6 to 12 feet in height and completely overtopped and suppressed the planted catalpa. Inasmuch as the poplars were the more valuable of the two species

FIGURE 12.—Black locust planted on waste land, supplying the farm with fence posts and enriching the soil.

because of their rapid rate of growth and the useful quality of the lumber, nature had beaten the owner at his own game. By making proper thinnings, then, in 5 years the woodland was brought to the very satisfactory condition of having a good stand of valuable species of trees filling all the openings and coming on to take the place of the mature trees as cut.

In choosing species for planting it is always best to consider first the most desirable kinds of native trees, since they are already acclimated to the local conditions and are least subject to failure. In general, the various conifers, including the pines, are to be recommended for planting in most sections of the country because they are quick-growing and yield softwood, which is in more demand than the hardwoods. Cottonwood, which is known for its rapid production of wood, is a good tree for relatively moist situations on good soil. Black locust takes root quickly on dry slopes and possesses to a marked degree the ability to hold the soil against agents of erosion (fig. 12). It is somewhat limited in its range of successful growth by a locust boring beetle, which, however, can be con-

trolled to some extent by means of proper spacing and handling of plantations.[5] Black walnut is probably one of the best kinds of trees for the farm, owing to the high quality and value of its wood and its production of edible nuts. They should never be planted in close formation but in widely spaced orchards or small groups and only on good agricultural soils.[6] The more desirable trees for the farm to be favored in planting over a large region of the eastern States include also the red and white pines, European larch and Norway spruce in the northern States, and shortleaf, loblolly, longleaf, and slash pines in the southern States, and yellow (or tulip) poplar and black locust in the eastern uplands and mountains.[7]

The planting of forest trees for shade, nut production, and ornamental purposes, as the original timber becomes scarcer, has a place of increasing importance on our farms and likewise in the towns and cities.

Information regarding the kinds of trees, ways of obtaining seed or seedlings, methods of sowing and planting, and the care of trees can be had upon application to the agricultural county agents, various State forestry agencies, or the Forest Service, United States Department of Agriculture.

The Federal Government is not authorized to distribute stock for forest planting, but under the provisions of the Clarke-McNary law it is cooperating with many of the State forestry departments in the growing and distribution of small trees for planting on farms for timber production or windbreaks.

Next to the improvement of existing woodlands by proper handling and good methods of marketing the products, no branch of farm forestry is of greater importance than forest planting (fig. 13).

ADDITIONAL INFORMATION

Additional information on various phases of forestry or timber farming can be had by writing to your State forestry department at the State capitol or to the extension service, State college of agriculture, or by applying to the county agricultural agent.

Federal publications on farm forestry include the following, which may be had at the prices indicated, in coin or money order, by addressing the Superintendent of Documents, United States Government Printing Office, Washington, D.C.:

Farmers in Northern States Grow Timber as Money Crop. (Farmers' Bulletin 1680). 5 cents.
The Farm Woods, a Savings Bank (Leaflet 29). 5 cents.
Making Woodlands Profitable in the Southern States (Farmers' Bulletin 1071). 5 cents.
Care and Improvement of the Farm Woods (Farmers' Bulletin 1177). 5 cents.
Measuring and Marketing Farm Timber (Farmers' Bulletin 1210). 5 cents.
Sawfly Injurious to Young Pines (Farmers' Bulletin 1259). 5 cents.
Use of Logs and Poles in Farm Construction (Farmers' Bulletin 1660). 5 cents.

[5] Refer to Farmers' Bulletin 1628, Growing Black Locust Trees. (Price 5 cents.)
[6] See Leaflet 84, Planting Black Walnut. (Price 5 cents.)
[7] Much practical information on what to plant and how to plant forest trees is found in Farmers' Bulletin 1123, Growing and Planting Hardwood Seedlings on the Farm (price 5 cents), and Farmers' Bulletin 1453, Growing and Planting Coniferous Trees on the Farm (price 5 cents).

Production of Maple Sirup and Sugar (Farmers' Bulletin 1366). 5 cents.
Pulpwood Crops in the Northeast (Leaflet 57). 5 cents.
More Turpentine, Less Scar, Better Pine (Leaflet 83). 5 cents.
Small Trees Wasteful to Cut for Saw Timber (Leaflet 55). 5 cents.
Planting Black Walnut (Leaflet 84). 5 cents.
Black Walnut for Timber and Nuts (Farmers' Bulletin 1392). 5 cents.
Growing Black Locust Trees (Farmers' Bulletin 1628). 5 cents.
Growing and Planting Coniferous Trees on the Farm (Farmers' Bulletin 1453). 5 cents.
Growing and Planting Hardwood Seedlings on the Farm (Farmers' Bulletin 1123). 5 cents.
Christmas Trees as a Cash Crop for the Farm (Farmers' Bulletin 1664). 5 cents.

FIGURE 13.—Forest trees needed to check soil erosion and make land bring an income.

The Windbreak as a Farm Asset (Farmers' Bulletin 1405). 5 cents.
Planting and Care of Shelter Belts on the Northern Great Plains (Farmers' Bulletin 1603). 5 cents.
Shortleaf Pine (Farmers' Bulletin 1671). 5 cents.
Loblolly Pine Primer (Farmers' Bulletin 1517). 5 cents.
Slash Pine (Farmers' Bulletin 1256). 5 cents.
Longleaf Pine Primer (Farmers' Bulletin 1486). 5 cents.
Southern Pine Beetle Serious Enemy of Pines in the South (Farmers' Bulletin 1586). 5 cents.
Chestnut Blight (Farmers' Bulletin 1641). 5 cents.
Nut Tree Propagation (Farmers' Bulletin 1501). 10 cents.
Basket Willow Culture (Farmers' Bulletin 622). 5 cents.
Trees for Roadside Planting (Farmers' Bulletin 1482). 5 cents.
Trees for Town and City Streets (Farmers' Bulletin 1208). 5 cents.
Planting and Care of Street Trees (Farmers' Bulletin 1209). 5 cents.
Propagation of Trees and Shrubs (Farmers' Bulletin 1567). 5 cents.
Transplanting Trees and Shrubs (Farmers' Bulletin 1591). 10 cents.
Pine Tree Treasures (Miscellaneous Publication 106). 5 cents.
Protect White Pine from Blister Rust (Miscellaneous Publication 22). 5 cents.
Currants and Gooseberries, their Culture and Relation to Blister Rust (Farmers' Bulletin 1398). 5 cents.
The Forest, A Handbook for Teachers (Miscellaneous Circular 98). 10 cents.

FILM STRIPS ON FORESTRY

Film strips on many forestry subjects have been prepared by the Forest Service and Extension Service. These are available by purchase at prices ranging from 50 to 80 cents each, depending upon their length. For further information it is suggested that requests be addressed to the Chief, Forest Service, or Director, Extension Service, United States Department of Agriculture, Washington, D. C. Following are titles of available film strips (35 mm in width):

Farm Forestry in the South (64 frames).
Range Management on the National Forests (50 frames).
Forest Planting in the Northeastern States (39 frames).
4–H Forestry Club Work in New Hampshire (46 frames).
Keeping Livestock out of the Woods in the North Central States (55 frames).
National-Forest Playgrounds (74 frames).
The Work of the Forest Service (76 frames).
Stop Gullies—Save Your Farm (62 frames).
Forest Conservation (63 frames).
Forest Fires—How They Are Caused, Their Effects, Detection, and Suppression (77 frames).
The Dutch Elm Disease in the United States (49 frames) (1936).
Farm Shelterbelts in the Plains Region (51 frames).
4–H Forestry in the United States (60 frames).
Farm Forestry Extension in the United States (69 frames) (1936).

Lantern slides, in sets, each of about 50 to 70 hand-colored slides and accompanied by a syllabus, or lecture, will be loaned by the Forest Service or the Extension Service (Washington, D. C.) for short periods on condition that borrowers agree to pay transportation charges both ways, to be responsible for slides lost or broken, and to forward the borrowed material promptly and in good condition upon request. Application should be made as far in advance of the need as possible. The subjects upon which slides are available include the following:

Forestry and agriculture.
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Tree windbreaks.
Farm woodlands.
Life of a tree.
Forest conservation.
Forestry in the United States.
The work of the Forest Service.
Keeping livestock out of the woods in the North Central States.
National-forest playgrounds.
Stop gullies—save your farm.
Forestry and nature study.
Forestry and manual training.
Forestry and geography.
Forest botany.
Forest fires—how they are caused, their effects, detection, and suppression.
Famous trees.

Application for lantern slides should be made to the Chief, Forest Service, or the Director, Extension Service, United States Department of Agriculture, Washington, D. C.

FORESTRY INCREASES FARM INCOME

BY

1. Making waste lands yield a profit by growing timber on
   - Poor soils
   - Steep slopes
   - Rocky lands
   - Wet lands
   - Unused corners
   - Eroded lands.
2. Furnishing paying employment for men and teams during the winter.
3. Utilizing timber better on the farm and avoiding waste by
   - Cutting low stumps and small tops,
   - Using substitute woods in construction,
   - Treating nonlasting woods.
4. Increasing crop yields by planting forest-tree windbreaks.
5. Growing more and better timber on the farm through
   - Protecting the woods from fire and overgrazing,
   - Selecting for cutting the mature, defective, overcrowded, and inferior kinds of trees, and leaving the straight, thrifty, and better kinds,
   - Planting to fill openings in woods.
6. Marketing the higher grades of wood products direct to consumers at fair prices as
   - Saw logs
   - Poles
   - Piling
   - Cooperage bolts
   - Handle bolts
   - Posts
   - Pulpwood
   - Firewood
   - Spoke blocks
   - Tannin bark.

MAKE YOUR WOODLAND PERMANENTLY PROFITABLE

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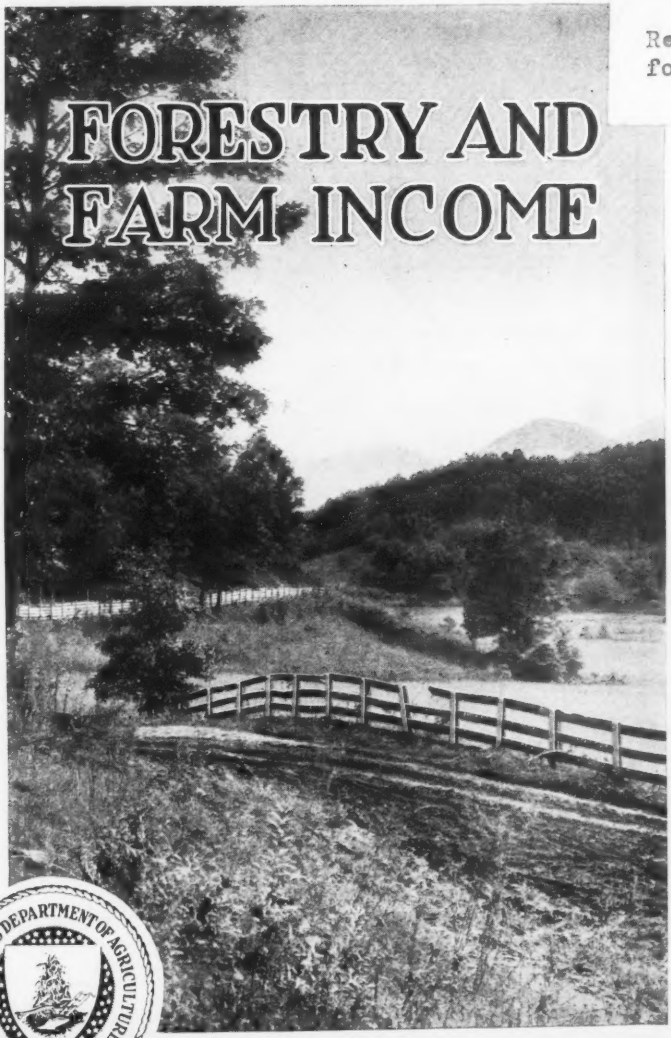

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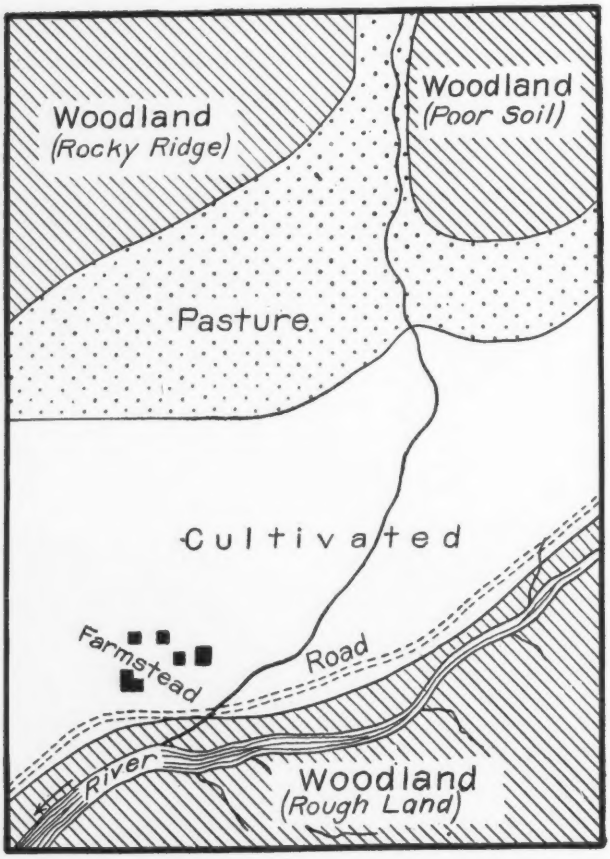
NO IDLE LAND ON THE FARM



Woodland on the hills, pasture land on the slopes, and cultivated land below

Washington, D.C.

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FORESTRY AND FARM INCOME

By WILBUR R. MATTOON, *extension forester, Division of Private Forestry, Forest Service*

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WHY FARM FORESTRY PAYS

THE RIGHT HANDLING of forest trees on the farm will make it more prosperous, add to its comforts as a home, and enhance its value as an investment.

The home forest, in many sections of the country, will supply the timber which the farm needs for buildings, fences, fuel, repairs of all kinds, and many other uses; and there will often be a surplus which can be sold in the form of standing timber, saw logs, posts, poles, crossties, pulpwood, fuelwood, and blocks or billets for making spokes, handles, spools, boxes, barrels, and excelsior.

A well-cared-for home forest serves also as a windbreak for buildings, a shelter for livestock, a protection of valuable lands from erosion, a means of profitable employment for men and teams during otherwise spare or idle time, a place of recreation, and an improvement in the appearance of the farm.

Trees improve and build up the soil. The leaves, small twigs, and other tree litter decompose and form a layer of dark-colored vegetable mold, which enriches the soil and stores up soil moisture. By means of this layer of mold, the binding of the soil by the roots of the trees, and the resistance of the trunks to the rapid flow of water, the woods prevent floods from gullying or destroying the land by erosion, particularly on steep slopes.

Even if a farmer sells no timber the woodland pays. The firewood, fence posts, and material for repair and construction on the farm, the time and money saved by having them conveniently on hand, and the protection against extremes of weather afforded the crops, farm buildings, and stock are worth considerably more than the trouble and expense of raising and caring for the trees.

The woods need not occupy good farm land that will grow other crops. Trees are, as a rule, grown on the less fertile, stony, thin, or poorly-drained soils and on steep slopes. Unused corners and

small uncultivated spots about the farm are good places for rapid-growing, useful trees. The chief economic reason for timber growing on the farm is to get a money return from those portions which would otherwise be unproductive.

Though the land on which the farm forest is situated may not be suitable for other crops, it should not be treated as waste land (fig. 1). By comparatively little care it can be made to produce timber of value. Only a little attention is required, and this may be given in the winter or when other farm work is slack. Many trees that used to have slight value, and even small trees that used to be counted as brush to be got rid of, are now generally used for commercial purposes.

A permanent woodland is an essential part of a well-equipped farm; and more than ever before farm woodland has become a valuable asset convertible into money.

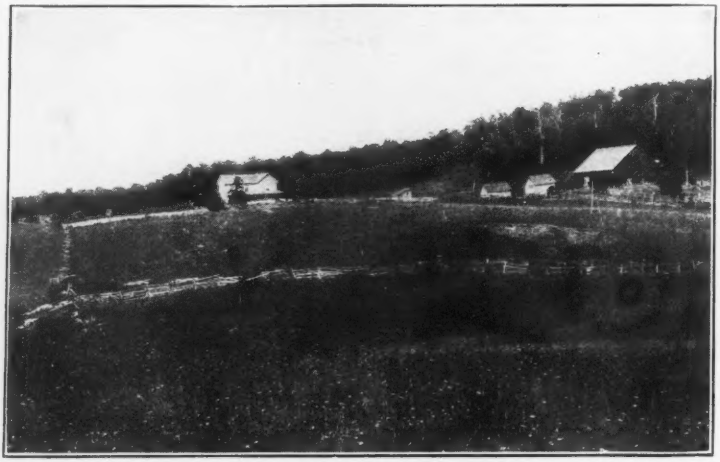

FIGURE 1.—Timber for the farm and for market, and shelter for the farmstead from woodland covering a stony ridge.

EXTENT OF FARM WOODLANDS

About one third of all the forest land of the United States is on farms. According to the 1935 census figures (table 1), this means that the farm woodlands amounted in all to about 185,000,000 acres. This is equivalent, roughly, to the aggregate area of New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, Ohio, Illinois, and Kentucky. If placed contiguously, they would form a solid strip 100 miles in width reaching from New York to a point one third the way across California.

The total woodland on farms east of the Rocky Mountains (fig. 2) amounts to 133,000,000 acres, or 89 percent of the total in the country. It covers an area as large as the entire forest lands of nearly all central and western Europe, including France, Germany, Switzerland, Austria, Denmark, Belgium, Netherlands, Poland, Czechoslovakia, Spain, Portugal, and Italy.

TABLE 1.—*Farm-woodland information, by regions and States, January 1935*

Region and State	Farm woodland area [1]	Farms [1]	Average woodland per farm (basis: all farms) [1]	Total land in farms [1]	Portion of farm in woodland [2]	Portion of forest land in State in farm woodland [1]	Increase in farm woodland last 5 years; [1] 1935 over 1930	Value of all farm-timber products in 1929 [2]
New England:	*Acres*	*Number*	*Acres*	*Acres*	*Percent*	*Percent*	*Acres*	*Dollars*
Maine	2,427,638	41,907	58	4,721,842	51.4	16.7	186,728	7,913,650
New Hampshire	1,273,826	17,695	72	2,115,548	60.2	28.3	201,826	3,063,363
Vermont	1,671,046	27,061	62	4,042,658	41.3	50.9	167,365	4,905,080
Massachusetts	1,027,724	35,094	29	2,195,714	46.8	31.4	165,155	2,981,126
Rhode Island	148,541	4,327	34	307,725	48.3	53.1	26,952	330,776
Connecticut	990,150	32,157	31	2,079,933	47.6	62.3	390,745	1,688,410
Middle Atlantic:								
New York	4,022,490	177,025	23	18,685,741	21.5	33.5	388,251	16,259,744
New Jersey	355,702	29,375	12	1,914,110	18.6	17.8	76,810	735,277
Pennsylvania	3,665,540	191,284	19	15,855,343	23.1	27.7	302,225	7,679,546
East North Central:								
Ohio	3,158,882	255,146	12	22,857,692	13.8	67.7	385,253	5,740,367
Indiana	3,064,187	200,835	15	20,518,745	14.9	88.4	444,707	5,375,846
Illinois	3,122,783	231,312	14	31,661,205	9.9	96.9	381,027	4,557,100
Michigan	3,816,124	196,517	19	18,459,922	20.7	18.6	581,386	8,801,817
Wisconsin	6,511,767	199,877	33	23,459,203	27.8	37.4	806,375	16,925,577
West North Central:								
Minnesota	5,383,250	203,302	26	32,817,911	16.4	24.6	636,947	10,756,988
Iowa	2,312,244	221,986	10	34,359,152	6.7	97.8	98,740	5,225,950
Missouri	8,902,997	278,454	32	35,054,542	25.4	50.6	1,202,997	11,850,371
North Dakota	575,435	84,606	7	39,118,136	1.5	99.0	17,693	486,550
South Dakota	635,709	83,303	8	37,101,871	1.7	32.9	145,152	544,705
Nebraska	934,237	133,616	7	46,615,762	2.0	85.6	−5,982	1,408,528
Kansas	1,233,036	174,589	7	48,009,770	2.6	98.0	123,530	2,306,529
South Atlantic:								
Delaware	234,511	10,381	23	921,251	25.5	72.2	30,813	419,876
Maryland	1,263,948	44,412	28	4,383,641	28.8	56.9	50,845	2,270,018
Dist. of Columbia	417	89	5	2,801	14.9	------	−62	449
Virginia	7,670,354	197,632	39	17,644,898	43.5	50.7	975,198	12,028,661
West Virginia	3,570,151	104,747	34	9,423,655	37.9	35.9	441,601	4,070,330
North Carolina	10,094,743	300,967	34	19,936,307	50.6	47.9	1,768,309	15,184,145
South Carolina	5,690,873	165,504	34	12,329,958	46.2	45.0	1,788,338	5,824,378
Georgia	11,675,399	250,544	47	25,296,522	46.2	50.7	3,302,432	8,861,877
Florida	2,611,295	72,857	36	6,048,406	43.2	11.1	719,457	1,262,546
East South Central:								
Kentucky	5,421,246	278,298	19	20,698,510	26.2	51.5	624,620	6,662,901
Tennessee	6,206,217	273,783	23	19,085,837	32.5	43.6	792,870	13,021,166
Alabama	8,247,231	273,455	30	19,660,828	41.9	38.0	1,761,250	8,504,708
Mississippi	7,562,659	311,683	24	19,655,413	38.5	40.7	1,338,350	9,280,785
West South Central:								
Arkansas	6,527,466	253,013	26	17,741,627	36.8	29.5	1,084,211	7,769,391
Louisiana	3,427,431	170,216	20	10,444,288	32.8	18.0	768,318	3,231,438
Oklahoma	4,846,755	213,325	23	35,334,870	13.7	41.0	787,262	2,829,834
Texas	25,135,727	501,017	50	137,597,389	18.3	89.2	9,446,244	8,440,281
Mountain:								
Montana	1,773,877	50,564	35	47,511,868	3.7	8.6	−46,029	964,202
Idaho	951,281	45,113	21	9,951,661	9.6	4.2	91,373	938,979
Wyoming	596,015	17,487	34	28,161,911	2.1	7.1	80,372	279,396
Colorado	1,759,005	63,644	28	29,978,472	5.9	8.6	217,542	524,553
New Mexico	2,131,666	41,369	52	34,397,205	6.2	10.9	213,532	403,432
Arizona	1,123,684	18,824	60	14,018,540	8.0	10.9	213,532	382,006
Utah	219,857	30,695	7	6,239,318	3.5	2.6	28,521	35,749
Nevada	89,254	3,696	24	3,621,769	2.5	.8	22,881	53,056
Pacific:								
Washington	2,354,168	84,381	28	14,680,097	16.0	10.6	479,928	3,262,215
Oregon	3,349,944	64,826	52	17,357,549	19.3	11.1	227,729	3,908,087
California	5,706,513	150,360	38	30,437,995	18.8	19.8	1,203,758	2,090,486
Total or average	185,474,935	6,812,350	27	1,054,515,111	17.59	30.07	35,530,240	242,042,245

[1] 1935 census.
[2] 1930 census was the last to give these values.

The average acreage of woodland on farms in the United States is about 27 per farm. This amount varies widely, however, in the different sections of the country, ranging from 48 acres in New England to 17 in the West North Central States (table 2).

Farms contain more than one half the entire hardwood forest lands of the United States. On the farms of this country the woods occupy a larger portion of the total land area than any other crop; in fact as much as all the cereal crops combined.

In the New England States more than 20 percent of all forested lands is on farms, and in Ohio, Indiana, Illinois, and Iowa from 70 to 97 percent. In the Southern States the farms contain almost one half of all the forest lands, or a total of more than 110,000,000 acres. In Maryland, Virginia, Georgia, Kentucky, and Texas more than 50 out of every 100 acres of forest land is on farms.

Information concerning the areas of farm woodland, percentages of farmland wooded, total number of farms, and other subjects will be found by States in table 1 and by regions in table 2.

FIGURE 2.—Important farm woodland area east of the Rocky Mountains.

TABLE 2.—*Farm-woodland information by regions*

Region	Total woodland on farms	Average woodland on farms (basis: all farms)	Portion of farm in woodland	Farms	Total land in farms
	Acres	*Acres*	*Percent*	*Number*	*Acres*
New England (Maine, N. H., Vt., Mass., R. I., Conn.)	7,538,925	48	48.8	158,241	15,463,420
Middle Atlantic (N. Y., N. J., Pa.)	8,043,732	20	22.1	397,684	36,455,194
East North Central (Ohio, Ind., Ill., Mich., Wis.)	19,673,743	18	16.8	1,083,687	116,956,767
West North Central (Minn., Iowa, Mo., N. Dak., S. Dak., Nebr., Kans.)	19,976,908	17	7.3	1,179,856	273,077,144
South Atlantic (Del., Md., D. C., Va., W. Va., N. C., S. C., Ga., Fla.)	42,811,661	37	44.6	1,147,133	95,987,439
East South Central (Ky., Tenn., Ala., Miss.)	27,437,353	24	34.7	1,137,219	79,100,588
West South Central (Ark., La., Okla., Tex.)	39,937,379	35	19.9	1,137,571	201,118,174
Mountain (Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.)	8,644,639	32	5.0	271,392	173,880,744
Pacific (Wash., Oreg., Calif.)	11,410,625	38	18.3	299,567	62,475,641
Total or average	185,474,965	27	17.59	6,812,350	1,054,515,111

VALUE OF WOODLAND PRODUCTS

Considerable income may be derived from the home forest. The total value of forest products taken from timbered land on farms reported in the 1930 census, and shown in table 3, was $242,042,245.[1] Over half of this represents the value of wood and various minor wood products used on the farm and the rest the value of the products sold, or cut and held for sale. For the farms reporting (2,558,899, or 40.7 percent of all the farms), this amounted to an average of about $95 per farm.

The value of the various forest products cut yearly on farms in New England amounted to nearly $21,000,000. The same item for the 14 Southern States from Maryland to Oklahoma and Texas makes a total yearly value of over $105,000,000. Each of 7 States reported more than $10,000,000 as the value of forest products cut on their farms, as follows, beginning with the highest: Wisconsin ($16,925,577), New York ($16,259,744), North Carolina ($15,184,145), Tennessee ($13,021,166), Virginia ($12,028,661), Missouri ($11,850,371), and Minnesota ($10,756,988). They were followed by Mississippi, Georgia, Michigan, Alabama, Texas, Maine, and Pennsylvania, each of which cut forest products worth more than $7,000,000.

Saw logs and veneer logs, crossties, poles and piling, fence posts, pulpwood, and fuel wood are the chief timber products cut on farms (table 3). Nearly 41 (40.7) farms out of every 100 in 1929 (according to the 1930 census) cut some timber products. Fuel wood is an important item. In 1929 an average of 14 cords was cut per farm reporting, or a total for the country of 34,100,529 cords. Piled continuously, this would reach twice around the world at the equator

TIMBER GROWING IN THE EASTERN PART OF THE UNITED STATES PAYS BECAUSE—

1. There is plenty of cheap land unfit for agriculture.
2. The abundant rainfall permits rapid tree growth.
3. Transportation facilities by rail and water are good.
4. Numerous large cities furnish a market.
5. The region is far removed from the virgin supplies of the Pacific Northwest.

[1] The latest census values. These items were not included in the 1935 census.

and overlap for a distance of 1,600 miles. The total value was $151,245,458. Fence posts are essential on the farm, and the farmers cut 98,664,249, or an average of 174 per farm. The saw logs and veneer logs cut on farms in 1929 amounted to a total of 5,000,000,000 board feet. The value of this material at the farm was $47,637,752. Farms produce relatively smaller amounts of saw timber and more of the total cut of fuel wood, posts, crossties, and pulpwood.

TABLE 3.—*Quantities of various timber products cut on farms and their total values, by regions*[1]

Region	Kind of timber product						Value of all products
	Saw logs and veneer logs	Fuel wood	Pulpwood	Posts	Crossties	Poles and piling	
	Board feet	*Cords*	*Cords*	*Number*	*Number*	*Number*	*Dollars*
New England [2]	409,252,000	1,534,323	286,889	1,468,516	341,349	73,604	20,882,405
Middle Atlantic [2]	255,585,000	2,771,188	79,522	9,382,626	911,863	406,226	24,674,567
East North Central [2]	375,540,000	5,211,268	209,153	16,731,088	1,504,810	233,578	41,400,707
West North Central [2]	260,909,000	4,557,450	163,700	25,263,432	1,564,757	236,258	32,579,621
South Atlantic [2]	1,579,573,000	7,881,673	398,631	8,512,614	2,961,920	986,297	49,922,280
East South Central [2]	1,409,725,000	6,241,856	161,882	12,571,457	3,634,212	549,763	37,649,560
West South Central [2]	359,713,000	4,356,687	124,324	19,579,414	3,842,006	348,494	22,270,944
Mountain [2]	59,784,000	406,370	7,253	2,428,843	234,501	244,314	3,581,373
Pacific [2]	332,845,000	1,149,714	54,405	2,726,259	343,368	219,881	9,260,788
Total quantity	5,042,926,000	34,110,529	1,485,759	98,664,249	15,338,786	3,298,415	
Total value...dollars	47,637,752	151,245,458	11,364,389	15,316,161	10,000,642	6,477,843	242,042,245

[1] Values by States are shown in table 1.
[2] For names of States included, see table 2.

Census of 1930.

SECURING GOOD FOREST GROWTH

At present farm woodlands are yielding, as a rule, only from one third to one half the wood they could grow. This is because only a few farmers realize the possibilities in their woodlands and give them proper care. As a result the home forest, which is close at hand, where comparatively little attention each year in protecting, cutting, and utilizing the timber would be very profitable, is in poor condition.

The amount of timber that an acre can grow in a year varies a good deal with the quality of the soil and moisture supply and the kind and number of the trees per acre. If fully stocked with trees and well cared for, an acre of hardwoods should grow yearly from about one half to one cord of wood and an acre of pine from one to two cords, a cord being equivalent to about 500 board feet of saw timber. Growth averages rather less in the northern part of the country because of the shorter season and somewhat more in the warmer southern part.

The chief essentials in keeping the trees growing are excluding fires and allowing the humus to collect on the forest floor. Large openings in the woods reduce the annual yield of timber and should not be allowed to occur. The length of time required to reach merchantable size varies with the kind of tree and the use to which its wood is to be put. Posts and crossties of some kinds may be grown in from 10 to 30 years, and most kinds of quick-growing trees will be large enough for saw timber in from 20 to 40 years.

After logging, a new stand of young trees generally starts naturally from seeds or sprouts from stumps. The natural seeding process in the woods can be helped by turning hogs into the woodland before the seed falls, or by harrowing the ground or conducting logging operations in a good seed year just previous to or shortly after the seed falls. By these means, the soil is stirred up, the seeds come in contact with it, and germinate more readily.

WOOD INSURES WINTER JOB

A farmer, settling on a quarter section of cut-over timberland in northern Wisconsin, reserved 70 acres for permanent woodland and cleared the rest. The natural timber was pine, spruce, and fir. After a few years he began cutting timber carefully, always leaving the thriftiest and best to grow. This was winter work for him and his sons.

During a period of 31 years he has kept a record of the amount of timber cut and the money received for it. The timber cut has amounted to 700,000 board feet of saw logs, which has brought him in an average gross return of $500 in cash yearly. Yet by his good management and cutting, the land at the end of the period (1932) has about 275,000 feet of standing timber.

The owner, in speaking of his forestry operations, admits that his woods have often been a source of temptation to him. "Many times in those earlier years", he said, "when cash was needed badly I was tempted to sell all the timber in one lump. But I did not do it. I knew that if I held on to my timber there would always be a winter job and some cash coming in. I am glad today that I never let it go."

Some points to be remembered about trees which sprout are (1) the most thrifty sprouts come from clean, well-cut stumps felled during the late fall, winter, or very early spring before the sap begins to flow; and (2) the top of the stump should be cut smooth

so as to shed water. Trees which sprout successfully include such hardwoods as the oaks, hickories, chestnut, basswood, gums, cottonwood, and willows, and young shortleaf and pitch pines.

PINE POLES FROM AN OLD POTATO PATCH

A young man from Nebraska moved on to a small, poor, sandy-land farm in southern Mississippi. Two acres of abandoned land, worn out in growing potatoes and watermelons, came up in longleaf pine saplings. This "brush", as the neighbors called such patches, meant more to this young farmer from the treeless plains than to the local residents, and he protected the young trees from fire. Later when the neighbors, in a friendly spirit, advised him to cut and burn his saplings in order to avoid the State tax on growing timber he refused to take their advice.

The young trees grew rapidly under protection, and the land became covered with a crowded stand of tall, straight poles. One day a timber buyer came along the sandy road. He looked over the stand, which he found contained more than 1,000 merchantable poles, and offered the owner $600 for the standing trees. This was more "cash money" than the farmer had seen at one time in many years, and he gladly closed the deal at the buyer's figure, although at current stumpage prices the timber was worth considerably more money.

With no expense for labor or fertilizer, the farmer's timber crop yielded him a good net profit averaging $5 an acre yearly for a period of 35 years. The income might have been even greater had the harvesting been spread over a period of years by frequent light cutting.

Woodlands may also be restocked with young trees by planting out small seedlings grown in nursery beds or dug up in the woods, or under some conditions by sowing the tree seeds. If trees are

to be planted, it is well to select those native to the region which grow most rapidly and produce the most useful kinds of wood (fig. 3).

NUMBER OF TREES IN GOOD NATURAL STANDS

Often the question is raised as to how many trees there should be in a well-stocked natural stand, namely, one that is not too dense or too open. The number varies with the prevailing sizes or diameters of the trees and also with the kind, or species, of tree. Table

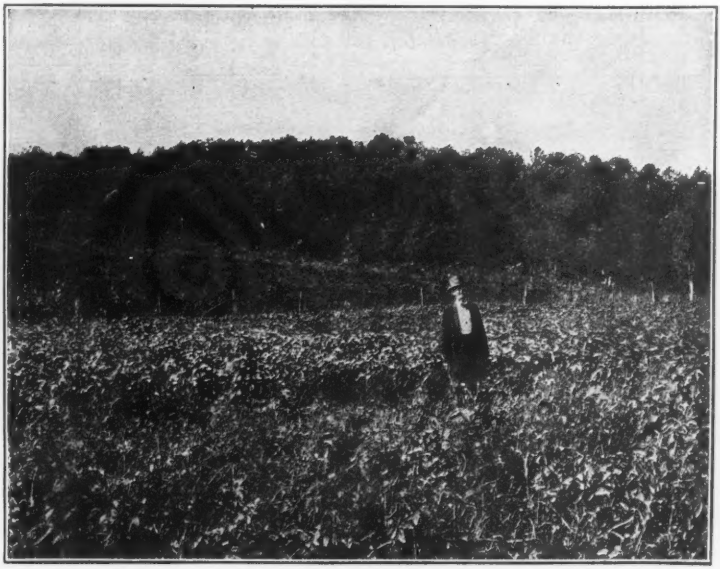

FIGURE 3.—Thrifty woods, good crops, and a happy farmer.

4, for example, shows the number of trees of different diameters and the total number of trees per acre for stands of four different groups or ranges of tree diameters. This holds generally good for natural stands of a good number of different kinds of trees in the eastern part of the United States. Those which demand much light, or are intolerant, such as the ash, black walnut, and red pine, must have an abundance of light and usually consume more soil moisture, and there should be somewhat fewer trees of these kinds per acre. Likewise trees such as the sugar maple, beech, yellow birch, and white pine, which can tolerate considerable shade, might stand closer together.

IMPROVING THE WOODS BY CUTTING

When rightly handled, a stand of timber yields continuous or repeated harvests. It should be cut with an eye to its continuous production on the land. The aim should be to keep the land producing timber of the best quality at the fastest rate.

TABLE 4.—*Approximate number of trees per acre in well-stocked stands composed of trees of similar diameter and different diameters* [1]

In stands where all trees have about the same diameter		In stands where trees have varying diameters				
		Trees per acre where the stand varies in size from—				Diameter of trees (breast high [2])
Diameter of trees (breast high [2])	Trees per acre	2 to 10 inches	2 to 14 inches	6 to 18 inches	10 to 24 inches	
Inches	*Number*	*Number*	*Number*	*Number*	*Number*	*Inches*
2	2,000	400	300	.....	.....	2
4	900	180	130	.....	.....	4
6	510	105	75	75	.....	6
8	320	65	45	45	.....	8
10	235	50	30	30	30	10
12	170	.....	25	25	20	12
14	130	.....	20	20	16	14
16	100	.....	.....	15	12	16
18	85	.....	.....	12	11	18
20	75	.....	.....	.....	9	20
22	65	.....	.....	.....	8	22
24	55	.....	.....	.....	7	24
Total	.....	800	625	222	113	.....

[1] Based on data compiled by the University of Michigan.
[2] Breast height is 4½ feet above the ground. Trees measured outside the bark.

Not all that is merchantable should be cut. In timber production on farms, it is not sufficient to leave only enough seed trees to restock the land. This would mean too long a wait between harvests.

TREES TO CUT FOR IMPROVING THE WOODS

Trees which are well suited for firewood and the removal of which will lead to an improvement of the remaining trees in the stand.

Trees which have been overtopped by others and have had their growth stunted.

Diseased trees, or trees seriously injured by insect attacks, or trees extremely liable to such injury; for example, chestnut in the region subject to blight or birch in the gipsy-moth area.

Badly fire-scarred trees.

Trees of the less valuable species, such as beech, birch, black oak, blackjack oak, or black gum, crowding the more valuable sugar maple, white or shortleaf pines, yellow poplar, or white oak.

Crooked trees and large-crowned, short-boled trees that will not make good lumber and that are crowding or overtopping others.

Slow-growing trees crowding fast-growing species of equal value.

Sound dead trees, both standing and down.

Mature trees that have reached their full growth.

There should always be plenty of younger trees as a good basis for growing later crops and also trees of larger sizes that can be cut at frequent intervals and keep up the cash income from timber.

Good management should result in a home forest fully stocked with sound, well-shaped trees of valuable and useful kinds that are growing as fast as possible. This can be brought about largely by "weeding", or cutting out the inferior kinds—the "weed" trees—for exactly the same reason that weeds are hoed out of the cornfield. The good trees need the light, space, soil moisture, and plant food that would otherwise be taken by the less valuable trees. Sometimes it becomes advisable to fill openings or improve the quality of the woods by planting seeds or seedlings of desirable kinds of trees.

FIGURE 4.—Woods improved by right cutting.

Dead and dying trees, diseased trees, deformed trees which shade out better ones, the less valuable kinds of trees, such as gray birch, aspen, blackjack oak, dogwood, sourwood, blue beech, ironwood, and others, and the less promising trees in crowded groups should be removed. The last operation is known as "thinning." By following these practices each year improvement in the forest is brought about in a relatively short time.

The wood removed in improvement cuttings often need not be a loss. It should be considered as an early crop that can be used or sold, generally at a price to show a profit on the work of thinning, while the woods are made more valuable by its removal (figs. 4, 5, and 6).

It is sometimes advisable to prune trees in forest stands, more especially in immature or younger stands of the more valuable kinds or in thrifty promising stands of any sort. The purpose is to clean the trunk of side branches, causing it to develop clear, high-grade

timber which commands higher prices. Such forest pruning began to be practiced first in New England with stands of white pine, where it has proved to be generally profitable. It is coming into good practice with farmers and other small owners in the Southern States on shortleaf, loblolly, slash, and longleaf pine; also on black

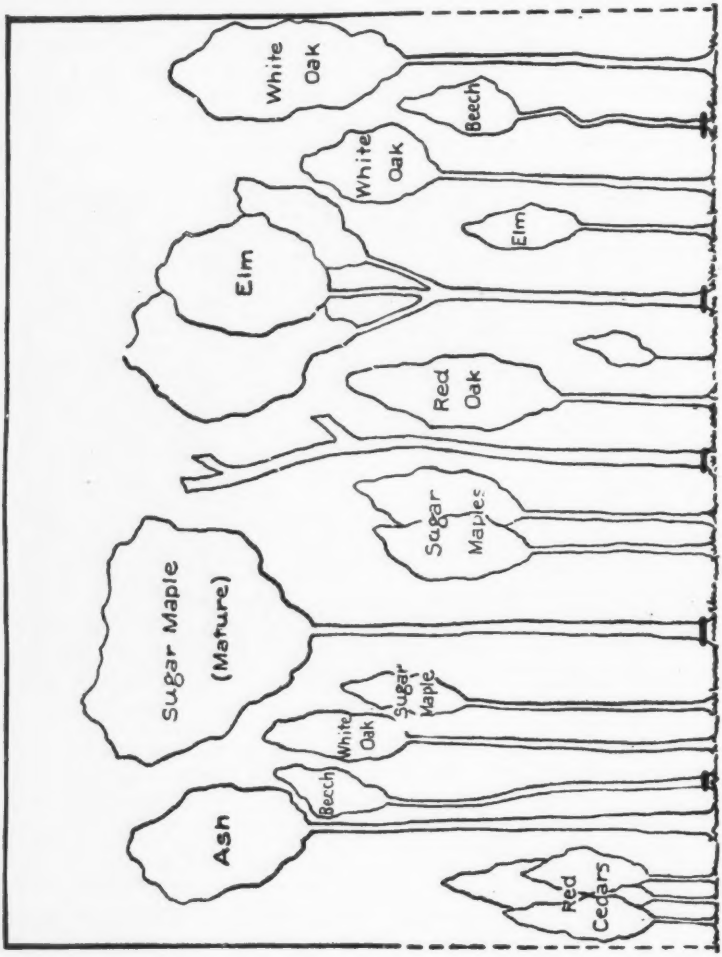

FIGURE 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species are marked at the base to be cut. A good stand will be left of thrifty middle-aged and promising young trees.

walnut, black locust, pine, and spruce forest plantations in the Central and Lake States.

Much more often than is commonly realized, grapevines and some other kinds of vines kill or stunt valuable trees, especially those that have rather open foliage like the black walnut, ashes, and locusts, and also trees standing in the open. The damage is caused by the

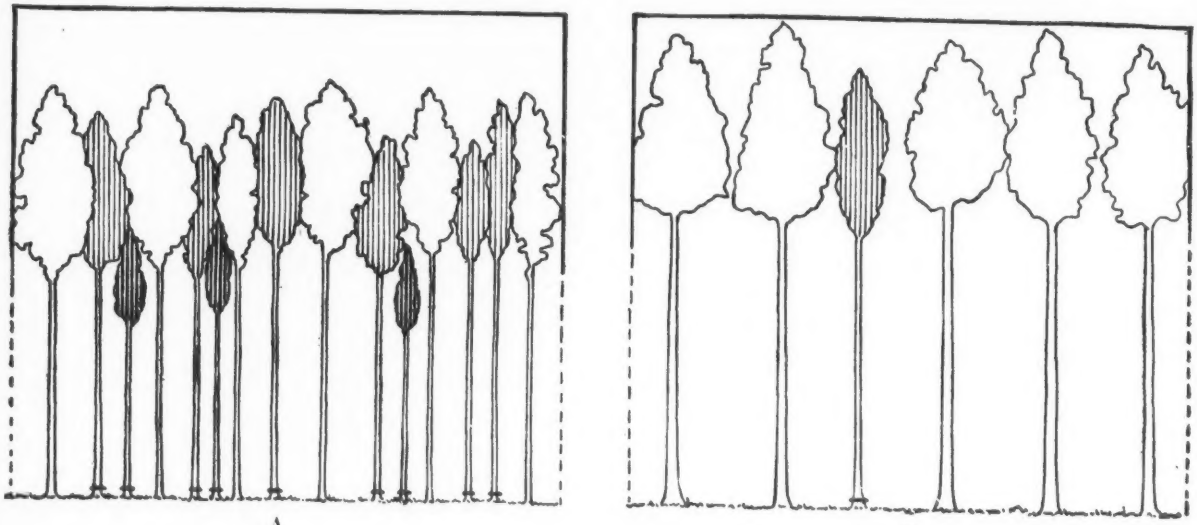

FIGURE 6.—The growth and value of pine are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber: A, before thinning—15 overcrowded trees (shaded trees to be cut); B, the same stand 5 years later, after thinning—6 larger and more valuable trees (shaded tree to be cut).

vines spreading their leaves above those of the tree, which are thus shaded out, and as a result the tree becomes sickly or dies. This is an insidious form of damage, which often escapes notice. Therefore, cutting the vines should not be overlooked or neglected.

GOOD LOGGING

The right use of the ax and saw and the protection of the land from fire are the keys to the growing of timber profitably and perpetually as a crop. This right use comes from good judgment in the selection of trees to be cut and in cutting and logging carefully. Lack of proper care in these two essentials of protection and cutting has resulted in the ruin of many pieces of valuable timber-producing land.

The trees to be cut should each be selected in advance and marked, preferably by the use of whitewash or a cheap white paint. Blazing the trunks with an ax causes wounds in trees, which sometimes are left standing for long periods before being cut. Mistakes made in marking trees with an ax are not so easily remedied as those made with a brush.

Cutting should be done so as to cause the least possible injury or destruction to other living trees, particularly young trees. In felling trees advantage should always be taken of natural openings in the woods.

Stumps should be cut low—12 inches or less in height—thus taking the best timber, which is usually in the base of the tree. Cases are known in which enough good-grade timber has been left in high stumps to have paid for the entire cost of the logging.

Logs should be cut well into the tops of the trees. The upper log or logs usually will yield only low-grade lumber, but it should be utilized.

Advantage should be taken of crooks to cut the ends of logs at crooks rather than between them.

All brush should be pulled away from living trees in logging to lessen the fire damage and, in southern pines, also the menace of infestation of beetles, or so-called "worms." Care against the outbreak and spread of fire is of extreme importance.

In getting logs out of the woods care should be used to avoid all unnecessary injury or damage to living trees, both young growth and mature trees. The healing of wounds is a slow process, and wounds in the bark are often serious as they freely admit infection of disease and the attack of insects.

ESTIMATING AND SELLING TIMBER

When timber is no longer growing at a profitable rate it should be cut and used or sold. A farmer who is ready to sell timber would profit by measuring his trees, estimating how much saw timber or other product they contain, and making inquiry to find out how much they are worth. If he does not know or cannot find out how to do this, he should employ some experienced and reliable person to estimate and value his timber for him.

The customary units of measure in selling farm timber are board feet, cords, linear feet, and the piece. A board foot, for example,

is 12 inches long, 12 inches wide, and 1 inch thick, or its equivalent. The standard cord of wood is 4 feet high, 4 feet wide, and 8 feet long. The linear foot is a measure of length only, without regard to the other dimensions of the material. Piece measure is only a count of the pieces in any form in which the wood is sold.

FIGURE 7.—Fast-growing hickory is in demand for implement handles and spokes.

Logs and standing trees are usually estimated in board feet. Saw timber is measured in board feet. Round timber, such as poles and piling, is usually sold by the linear foot. Firewood, pulpwood, and wood cut in short lengths for distillation, handle stock (fig. 7), and other uses are usually sold by the cord. Fence posts, ties, telephone poles, and some other forms of timber are sold by the piece.

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Saw timber in the standing tree is estimated by measuring the diameter of the tree, outside the bark, at breast height (4½ feet above the ground), and measuring or estimating the height of the tree. When these measurements are known, the contents of the tree can be found from a volume table.[1] Often the length of the part of the trunk to be used is taken in units, or number of 16-foot logs, instead of the total height of the tree.

A volume table is one showing in board feet the amount of timber that can be sawed from trees of given heights and diameters or from a given number of merchantable logs and diameters. For example, a volume table for white oak would show that a tree 18 inches in diameter (measured outside the bark at breast height) and having three merchantable 16-foot logs will saw out 286 board feet of lumber. Volume tables are made for different kinds of trees, each table based on the average of many measures of felled trees.

[1] For volume tables and other information on estimating and measuring timber, see Farmers' Bulletin 1210, Measuring and Marketing Farm Timber (price 5 cents), or apply to State foresters.

TEN HELPS IN MARKETING WOODLAND PRODUCTS

1. Get a reliable estimate of the amount and value of the timber to be sold. If necessary get experienced help. Know what you want to sell.

2. Before selling, consult neighbors who have sold timber, and benefit from their experiences.

3. Investigate local timber requirements and prices. Your products may be worth more locally because transportation is saved.

4. Get prices for various wood products from as many sawmills and other wood-using plants as possible.

5. Advertise in papers and otherwise secure outside competition.

6. Secure bids, if practicable, both by the lump and by log-scale or other unit measure.

7. Be sure that you are selling to responsible purchasers.

8. Market the higher grades of timber and use the cheaper for farm purposes.

9. Remember that standing timber can wait over a period of low prices without rapid deterioration.

10. Use a written agreement in selling timber, especially if the cutting is to be done by the purchaser.

A saw log is measured by taking the length of the log and its diameter inside the bark at the small end, then employing a log rule to estimate the amount or number of board feet it contains. A log rule is a statement of the estimated number of board feet of lumber that can be sawed from logs of different lengths and sizes. A good rule for 12-foot logs is to multiply the diameter inside bark at the small end by half the diameter. For shorter logs the contents will be proportional to the length of the logs. Thus, a 12-foot log 16 inches in diameter will saw out about 16×8 or 128 board feet, while a 10-foot long log 14 inches in diameter will cut $\frac{10}{12}$ of 14×7, or $81\frac{2}{3}$ board feet.

It is very important to consider what log rule is to be used, because much depends upon it in measuring and selling timber. There is a great difference in the amount of timber and likely often in the resulting money return.

The International rule (table 5) gives log volumes that closely approximate what can be sawed out by using good methods. Owners of small logs for sale will benefit when this or some equally close rule has come into general use.

TABLE 5.—*International log rule*

[The contents of logs in board feet, by using a circular saw, cutting ¼-inch kerf, and sawing carefully by good methods]

Diameter of log at small end and inside bark (inches)	Contents of log in board feet when length of log is—												
	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet	19 feet	20 feet
4	2	2	3	3	4	5	5	5	6	7	7	8	9
5	4	5	6	7	7	8	9	11	12	13	15	16	17
6	7	9	10	11	13	14	16	18	19	21	23	25	27
7	12	14	15	17	19	21	24	26	28	31	34	36	39
8	16	19	21	24	27	30	33	36	39	42	46	49	52
9	23	26	29	33	36	40	43	47	51	55	59	63	68
10	29	33	37	42	45	51	54	59	64	69	75	82	89
11	36	42	46	52	57	63	68	74	80	86	95	100	107
12	44	51	57	62	70	77	83	91	97	103	111	119	129
13	52	60	68	76	83	92	100	108	116	124	134	143	151
14	62	71	80	98	107	107	117	127	136	147	158	168	176
15	73	82	94	104	114	125	136	146	157	170	181	195	204
16	84	96	108	119	131	144	156	167	181	194	207	222	233
17	96	110	123	136	149	163	177	192	205	221	235	251	265
18	110	124	139	155	169	185	201	218	232	250	267	282	300
19	123	140	156	175	190	210	225	244	261	280	299	317	337
20	138	157	174	197	212	232	251	270	290	310	330	352	374
21	152	172	193	215	234	256	279	299	321	344	366	389	412
22	168	192	214	238	259	282	307	330	354	379	404	429	453
23	186	212	235	260	285	310	337	362	388	415	445	470	498
24	203	232	257	285	311	339	367	398	424	452	484	514	543
25	223	253	281	311	339	370	400	433	462	494	526	560	590
26	241	273	304	337	368	402	435	468	502	537	570	606	640
27	262	296	329	364	400	434	471	504	543	580	617	657	692
28	281	319	356	395	432	470	509	545	586	623	664	706	748
29	303	344	383	425	463	505	546	587	630	670	712	756	801
30	326	369	411	455	498	542	586	628	674	719	765	810	858

The Doyle rule (table 6), although very inaccurate for small-sized timber, is probably most commonly used in the United States. To determine the number of board feet in a log by this rule, deduct 4 inches from the diameter of the small end, then square one fourth the remainder and multiply the product by the length in feet.

For example, a log measuring 20 inches at the small end and 12 feet long contains 192 feet. The Doyle rule, in many sections the standard and in some States the legal rule, is unfair to the seller for measuring logs below 28 inches in diameter. In the early days of large cheap timber it was fairly satisfactory, but for small-sized timber it gives such low values as to make it unsatisfactory. The Scribner rule is fairer than the Doyle. Careful sawing, however, should result in 10 to 20 percent more lumber from second-growth timber than is credited by the Scribner rule.

TABLE 6.—*Doyle log rule*

Diameter of log at small end and inside bark (inches)	Contents of log in board feet when length of log is—												
	6 feet	7 feet	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet
6	1	2	2	2	2	3	3	3	3	4	4	4	4
7	3	4	4	5	5	6	7	7	8	8	9	10	10
8	6	7	8	9	10	11	12	13	14	15	16	17	18
9	9	11	12	14	16	17	19	20	22	23	25	27	28
10	13	16	18	20	22	25	27	29	31	34	36	38	40
11	18	21	24	28	31	34	37	40	43	46	49	52	55
12	24	28	32	36	40	44	48	52	56	60	64	68	72
13	30	35	40	46	51	56	61	66	71	76	81	86	91
14	37	44	50	56	62	69	75	81	87	94	100	106	112
15	45	53	60	68	76	83	91	98	106	113	121	129	136
16	54	63	72	81	90	99	108	117	126	135	144	153	162
17	63	74	84	95	106	116	127	137	148	158	169	180	190
18	73	86	98	110	122	135	147	159	171	184	196	208	220
19	84	98	112	127	141	155	169	183	197	211	225	239	253
20	96	112	128	144	160	176	192	208	224	240	256	272	288
21	108	126	144	163	181	199	217	235	253	271	289	307	325
22	121	142	162	182	202	223	243	263	283	304	324	344	364
23	135	158	180	203	226	248	271	293	316	338	361	384	406
24	150	175	200	225	250	275	300	325	350	375	400	425	450
25	165	193	220	248	276	303	331	358	386	413	441	469	496
26	181	212	242	272	302	333	363	393	423	454	484	514	544
27	198	231	264	298	331	364	397	430	463	496	529	562	595
28	216	252	288	324	360	396	432	468	504	540	576	612	648
29	234	273	312	352	391	430	469	508	547	586	625	664	702
30	253	296	338	380	422	465	507	549	591	634	676	718	760

In finding a buyer for his timber the owner should inquire of his neighbors who have sold, or at local sawmills, wood yards, wood-using factories, railroad stations, and telegraph and telephone companies. He should also advertise in the papers and write personal letters furnishing a brief description of the kind, quality, and amount of timber for sale, in order to awaken competition among local and outside buyers. Securing a number of bids for the same piece of timber will tend to develop the best market and increase returns. It is well to have a written agreement as to the manner in which the timber shall be cut, and the amount and form of payment [2] (fig. 8).

Some of the industries buy their supplies largely or wholly in the log; hence, in many cases it will pay the farmer to look up these special markets for his logs, bolts, poles, ties, etc. Industries buying their supplies more or less generally in the form of round timber are manufacturers of handles, cooperage, veneer, woodenware and novelties, shuttles, bobbins and spools, vehicle stock, athletic goods, and pulpwood. Poles are purchased by electric-lighting, power, and tele-

[2] For further information see Farmers' Bulletin 1210 (price 5 cents), or apply to your State forestry agencies.

phone companies. Markets for piling will be found by applying to railroads, wharf, bridge, and bulkhead contractors in the larger towns and cities. For prices on ties, consult the nearest local railroad station agent. Cordwood is used by brickmakers, bakeries, limekiln operators, and fuel dealers in towns.

FIRE PROTECTION

The forest must be protected. Fire, careless logging, tree diseases, insect pests, and, in the hardwoods, grazing are the principal sources of injury.

FIGURE 8.—Choice logs bring high prices and are often shipped long distances.

Fire kills the little trees and weakens full-grown trees so that they may become diseased or infested with insects. It also destroys the humus cover of leaves and twigs that ordinarily protects the trees against summer drought and heat, conserves water for the springs and streams, and enriches the soil by adding nitrogen.

HELP PREVENT WOODS FIRES

BE SURE your match is out before throwing it away.
DON'T throw away burning tobacco.
CHOOSE a safe place and make your camp fire small.
PUT OUT your fire with water and then cover it with earth.
DON'T make large brush heaps. Choose a still day for burning, and plow furrows to protect near-by woods.

BE CAREFUL WITH FIRE

Dead trees and tops cut in logging are a fire menace and should, if possible, be utilized. Saw logs or firewood can be made out of the dead trees, and the unused large tops should be lopped so that they will lie close to the ground and rot quickly.

Some idea of the prevalence of fires in the United States east of the Rocky Mountains may be formed from the fact that here occur 90 out of every 100 forest fires. For the 5 years 1931 to 1935, inclusive, an average of 150,698 fires yearly in this region burned over 39,371,690 acres of land and caused an enormous property loss. While fires were reported from all States, a greater number of fires occurred in the southern pine district than in any other important forest region.

Practically every State has strict laws against the setting of fire and carelessness in the burning of brush. In a number of States the railroads are required to use efficient spark arresters in their locomotives and burn fire lines along their rights of way.

Forest fire protective systems have been established by most of the States cooperating with the Federal Forest Service under the provisions of the Clarke-McNary Act. Patrolmen are employed who travel through the districts where there is danger of forest fires, watch for fire, and educate the public in the need for care in preventing fire and for getting quickly to any fire that may occur. Owners of woodland should get in touch with the State foresters and fire patrolmen, and secure their cooperation and assistance in keeping down fire hazard and damage.

GRAZING AND INSECT DAMAGE

Horses and cattle eat and break down young trees and pack the ground hard. Sheep and goats destroy large numbers of small trees by eating them. Hogs root up the ground, digging up the young trees and roots and sometimes eating the roots. They also prevent young trees from starting by devouring the nuts and other seeds from which they grow. On the other hand, however, trees bearing small or unpalatable seeds often start well after hogs have rooted up the leaf litter and soil.

Some people fear that good pasture will be wasted by keeping stock out of the woods. This is hardly true, since a fully stocked woodland has little or no grass in it, for the reason that there is insufficient light (fig. 9). Studies in farm management in northwestern Pennsylvania show that an open stand of trees, such as occur in average wooded pastures, reduces the pasturage value of the land as much as 65 to 70 percent.[3] Grass in the woods is a sign that the stand is in poor condition and that the trees are too far apart for growing a good quality and large amount of timber. This does not apply in the southern longleaf pine region or in some of the western forests, where much good timber occurs in open stands. Grass grown under the shade of trees is less nutritious than that grown in the open, so its actual food value is small.

Plenty of shade for livestock should be provided in pastures, but pasture land and woodland are most profitable when managed separately, each for the growing of its own individual product.

[3] U. S. Department of Agriculture Bulletin 853, The Organization and Management of Farms in Northwestern Pennsylvania. (Price 10 cents.)

Woodland may be guarded against serious insect damage and disease by removing dead or dying trees and all those showing signs of insect attack or decay. In the South, pine should be cut in the cool part of the year. When it is cut in the summer, bark beetles and wood borers injure the cut trees, multiply rapidly, and spread to living trees, which they often kill by eating the rich inner bark for food. A special treatment for weevil-infested white pine has been developed. In cases of insect menace or injury it would be best to get into communication with the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, or the State entomologist.

FIGURE 9.—Little or no grass grows in a fully stocked woodland.

USING TIMBER AT HOME

Lack of knowledge of the proper use of timber is one form of farm mismanagement.

It is a mistake to saw up choice logs of white oak, ash, cherry, and yellow poplar for rough uses at home, or to use clear black walnut for gate boards, or split up white oak butts for fence posts (fig. 10). Many valuable logs go into crossties, when they would bring the owner much more if sold as saw logs. Large numbers of young, rapid-growing trees, producing only one small tie, are cut, which, if left to grow for from 3 to 5 years, would more than double the profit.

Cutting is commonly done promiscuously without regard to continuing the future productiveness of the woodland, and large amounts of timber are commonly wasted in high stumps and long tops.

The importance of the home forest as a reserve for "pinch" times cannot be overestimated. In the period of business reorganization beginning in about 1930, for example, communities and individual farms having local supplies of standing timber were in a favorable condition since lumber, pulpwood, ties, poles, and especially fuel wood, kept moving although in restricted amounts. Farmers with

such supplies also had materials for repair of farm buildings and necessary new construction.

Timber that is cut in the late spring and summer months should be handled with special care to avoid injury. This is because freshly cut wood is then more likely to be attacked by insects and fungi than during the cold part of the year. Seasoning also proceeds more rapidly during the warmer season and may cause excessive checking. If rightly handled, posts, poles, and logs may be cut at any season without their durability being affected. In no case should wood be allowed to lie in direct contact with the ground. The opportunity for insect attack and decay can be reduced to a minimum by peeling

FIGURE 10.—Because they split easily, clear white oak butt logs have been worked up into fence posts when several farmers could have jointly shipped a carload at fancy prices.

the timbers and open-piling them off the ground in a shaded but dry place. This, however, does not retard checking of the wood.

Logs are sometimes stored under water in the hot season to prevent blue stain, checking, insect attack, and decay. Painting the ends of logs with a yellow ocher or barn paint will very materially retard injury by end checking. Painting peeled timbers with creosote will prevent sap stain and decay.

Well-seasoned fuel wood makes more heat and saves time and worry in the home. Thus a woodshed may be a good investment in more ways than in money saving.

TREATING FENCE POSTS

Every farm needs fence posts, but relatively few have sufficient supplies of lasting wood to meet home needs. This is particularly true in the Middle West and South. By means of a simple method of treating timber in open tanks with coal-tar creosote, the post and

pole problem can be readily solved. By this process such short-lived woods as soft maple, beech, birch, sweet gum, black gum, young or sap pine, and red oak are made durable for use in the ground for 10 to 30 years (table 7).

TABLE 7.—*Relative economy of treated and untreated fence posts* [1]

	Untreated sap pine	Untreated white or post oak	Creosoted sap pine
Cost of post	$0.05	$0.21	$0.08
Cost of treatment			.25
Cost of setting	.15	.15	.15
Total cost of post in ground	.20	.36	.48
Average life of post	[2] 2	[2] 6	[2] 15
Average yearly cost	0.10	0.06	0.03⅓
Average yearly cost of 1 mile of fence (posts 1 rod apart)	32.00	19.20	10.24

[1] The costs of materials and labor should be regarded as showing relative rather than absolute values.
[2] Years.

The treating of fence posts is an unusually favorable project for cooperation on the part of several farmers. This refers especially to buying equipment and supplies of coal-tar creosote.

A comparison of the annual costs of maintaining four fences built with posts of untreated sap pines, untreated white or post oak, treated white or post oak, and treated sap pine, respectively, indicates a saving of $8 to $23 per mile in favor of the treated pine.

Although more expensive at the outset, creosoted posts are generally more economical to use than many kinds of untreated, short-lived woods, because of their much greater lasting qualities. The exceptions would be in remote localities with cheap wood and labor and where it would be expensive to obtain creosote. The large saving in the replacement charges, which ordinarily mount up so high in maintaining a fence, and the use of cheap and inferior kinds of wood in the first place, much more than offset the increased cost of thorough treatment with creosote (fig. 11). Treated posts are a good investment, and their use where lasting woods are scarce or expensive is a sign of sound judgment in farm management.

Cutting and seasoning.—It is important that the timber be peeled and thoroughly seasoned before an attempt is made to treat it. Small flakes of inner bark left on the wood prevent proper absorption of the preservative at those places. Peeling is done most easily during the spring months, but is carried on at other seasons of the year. The posts to be treated should be peeled from 3 to 4 months, depending upon the weather, before treatment, and open-piled in a dry situation to effect proper seasoning.

Kinds of posts.—Because they have a uniform absorbing surface of sap wood, round sticks are more satisfactory than split timber for treatment. It is not profitable to treat lasting woods, such as red cedar, black locust, chestnut, and white oak. Practically all of the softwoods or sapwoods may be treated and profitably used as posts.

Small-sized timber.—When treated timber is used it is not necessary to cut the large-sized line posts commonly employed untreated in the past. A post from 2 to 3 inches in top diameter, long enough

to allow only a few inches above the top wire, costs less for creosoting and labor in handling, lasts as long as larger-sized timber, and possesses ample strength for ordinary fences. Small-sized trees are abundant in second-growth timber, often being crowded out by more vigorous neighboring trees. Cutting these for fence posts utilizes the forest product that would often otherwise be wasted, improves

FIGURE 11.—The treating of nondurable timber brings many kinds of wood into new forms of utilization. (Photo by courtesy of Iowa State College of Agriculture.)

the remaining stand, and furnishes profitable employment on the farm during slack time.

Kind of treatment.—The application of creosote by brushing over the whole post is only slightly effective in preventing decay, and rot often starts in small cracks which are not reached by the brush, or in checks which soon develop while the post is in use. Open-tank treatment with a hot bath followed by a cold bath is recommended for fence posts. The sapwood surrounding the heartwood takes treatment readily and is thereby protected against the entrance of decay.

Preservative.—It is important to use a good preservative, and coal-tar creosote has been found to be by far the most satisfactory material. Ordinary gas tar or coal tar has been used more or less, but it is usually too thick even when treated to give a fair degree of penetration.

Treating.—The best treatment is that which results in the deepest penetration into the wood with the least absorption of creosote. The butts of the posts should be placed for 1 to 2 hours in creosote heated to a temperature of 180° to 220° F. It is important to treat the wood to a height of a foot above the proposed ground line. In the Southern States the entire post should then be submerged into cold oil, 80° to 100°, for 1 to 2 hours, or for such time as is necessary to get a good penetration. In the North, where decay is less rapid, the cold treatment is applied usually to the butts only, the tops being treated by painting or dipping in creosote.

A satisfactory outfit for treating posts successfully consists of an upright cylindrical tank for the hot treatment and a horizontal rectangular tank for the cold bath.

A saving in cost can be made by two or more farmers joining together in the purchase and use of treating tanks. In a number of instances this has proved to be a successful form of cooperation.

PLANTING FOREST TREES

The profitableness of forest planting cannot be laid down by any rule, since it is subject to very wide variation. Rapid-growing trees of good; standard value can often be grown profitably by farmers on portions of worn-out or idle lands or as a commercial enterprise on cheap lands located relatively near good markets. Examples may be cited of white and red pines in New England, black locust and black walnut in many districts of the eastern part of the United States, and shortleaf, loblolly, longleaf, and slash pines in the Southern States.

White pine, especially when planted in mixture with hardwoods, and red pine are among the most promising crops for large areas of the Northeastern States. The largest known reforestation operation undertaken by an individual private landowner is one carried on in the upper portion of the Hudson River in eastern New York, where one owner has planted about 5,500 acres, using a total of 5,473,600 small trees, mostly white, red, and Scotch pines and Norway spruce. In the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, Minnesota, and elsewhere the white pine blister rust is present, and planters of white pine should protect it from this disease by destroying all wild and cultivated currants and gooseberries within 900 feet of the plantation. These bushes are the alternate hosts of the blister rust and if they are permitted to remain near native or planted white pines in localities where the blister rust is prevalent the trees become diseased and gradually die. Usually the cost of uprooting wild currant and gooseberry bushes is small.[4]

Large areas of fine young forest stands have been established in the South by setting out 1-season-old seedlings of the four important

[4] For further information relative to protection from blister rust consult your State forester or the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

RETURNS IN GROWING TIMBER IN NEW HAMPSHIRE

This white pine was planted on an abandoned sidehill pasture of about 3 acres in New Hampshire. At the age of 44 years (shown in the illustration) it contained about 90,000 board feet of lumber. The total outlay at the time, counting the value of the land and labor of planting, was $35. The timber was worth on the stump something over $1,500 at the high prices prevailing when the above picture was taken.

The farmer had this strip of practically worthless sidehill, and with some spare time on hand dug up 1,400 seedling pines growing in a thicket and set them out. About 20 years later the farmer died and among his assets was this small tract of young pine for which, much to her surprise, the widow was offered $300. The second owner retained it for about 15 years and then, wishing some money, sold it. Soon afterwards it came into the hands of the third owners, a lumber company, for something over $1,000.

Assuming a land value of $5 per acre, and a charge for taxes and oversight for the period averaging $2 per acre per year, the operation yielded a return of 5 percent on the total investment in land, labor, and annual outlay, and in addition a neat sum equivalent to a yearly net profit from the start of $2.34 per acre. To get this return required favorable markets.

kinds of pines. The largest such young planted forest is located in southeastern Louisiana, where a lumber company has planted 30,000 acres. Hundreds of farmers in the South are turning worn-out farm lands into timber production by planting yearling pines. In the piedmont the pines are mostly the shortleaf and loblolly, and in the lower piedmont and Coastal Plain they are the slash and longleaf pines. Both of the latter trees yield crops of crude turpentine, from which spirits of turpentine and rosin are produced. Owners often say that the return from the "gum" is double that obtained later from the timber.

Of the two trees, the slash pine is more extensively planted because of its very rapid growth when young and its heavy yield of gum or crude turpentine. One farmer in south Georgia has reforested about 2,000 acres of his worn-out cotton fields by planting slash pine seedlings at the rate of about 750 per acre, or a total of 1,500,000 trees.

In rich agricultural belts the planting of forest trees on a large scale for direct money returns would undoubtedly prove to be a losing investment. There, however, considerable forest planting goes on, but on relatively small, isolated tracts on farms and for special purposes, depending upon local conditions. Forest trees are planted chiefly to check soil erosion on slopes; to afford a windbreak as shelter for growing crops, livestock, and man; to produce Christmas trees; and to utilize to the best advantage rough, stony, or poor soils and inaccessible and wet lands. Black walnut is one of the best trees to plant in good soil over much of the region.

In western Tennessee, where the soil is a very deep, rich, clay loam, known locally as "brown loam", the planting of black locust trees has been extensively pushed by the State as a means of reclaiming and making profitable badly eroding lands and at the same time checking at the source of the small streams the silting which results in expensive dredging operations on the Mississippi River and its navigable tributaries. Similar conditions prevail over large areas in other States of the Mississippi Basin and in the piedmont and lower slopes of the Appalachians.

On the farms of the eastern part of the United States many thousands of acres of slopes, from which the forest should never have been removed, have been cleared and have become waste. Careful cutting by the selection method would have resulted in keeping the land continuously productive. This mistake is still going on in some rural sections where foresight and study have not yet been generally applied to farm management.

Forest-tree planting is practicable as a means of putting idle land to producing, checking soil erosion, regulating stream flow, and improving the quality of woodlands by increasing the quantity and value of their product. Through carelessness, cutting, fire, and other agencies, many woodlands have fallen far below their maximum capacity of production. By the application of a little intelligent guidance in making proper improvement cuttings and by affording protection from grazing animals and fire, it is often possible within the period of a few years to bring about a marked change for the better in the composition and quality of the woodland. This method

often succeeds even better than planting trees. This is illustrated by the experience of woodland owners. A progressive farmer in Summit County, Ohio, wishing to handle his woodlands rightly, excluded all livestock by fencing and at the same time planted catalpa in the larger openings in his woods. In 10 years the forest floor, instead of being bare and packed hard, consisted of a deep layer of spongy organic matter, affording protection to the roots of the trees. A complete understory of young yellow or tulip poplars, hard maple, beech, elm, white oak, hickory, and ash had sprung up. The volunteer poplars had grown to from 6 to 12 feet in height and completely overtopped and suppressed the planted catalpa. Inasmuch as the poplars were the more valuable of the two species

FIGURE 12.—Black locust planted on waste land, supplying the farm with fence posts and enriching the soil.

because of their rapid rate of growth and the useful quality of the lumber, nature had beaten the owner at his own game. By making proper thinnings, then, in 5 years the woodland was brought to the very satisfactory condition of having a good stand of valuable species of trees filling all the openings and coming on to take the place of the mature trees as cut.

In choosing species for planting it is always best to consider first the most desirable kinds of native trees, since they are already acclimated to the local conditions and are least subject to failure. In general, the various conifers, including the pines, are to be recommended for planting in most sections of the country because they are quick-growing and yield softwood, which is in more demand than the hardwoods. Cottonwood, which is known for its rapid production of wood, is a good tree for relatively moist situations on good soil. Black locust takes root quickly on dry slopes and possesses to a marked degree the ability to hold the soil against agents of erosion (fig. 12). It is somewhat limited in its range of successful growth by a locust boring beetle, which, however, can be con-

trolled to some extent by means of proper spacing and handling of plantations.[5] Black walnut is probably one of the best kinds of trees for the farm, owing to the high quality and value of its wood and its production of edible nuts. They should never be planted in close formation but in widely spaced orchards or small groups and only on good agricultural soils.[6] The more desirable trees for the farm to be favored in planting over a large region of the eastern States include also the red and white pines, European larch and Norway spruce in the northern States, and shortleaf, loblolly, longleaf, and slash pines in the southern States, and yellow (or tulip) poplar and black locust in the eastern uplands and mountains.[7]

The planting of forest trees for shade, nut production, and ornamental purposes, as the original timber becomes scarcer, has a place of increasing importance on our farms and likewise in the towns and cities.

Information regarding the kinds of trees, ways of obtaining seed or seedlings, methods of sowing and planting, and the care of trees can be had upon application to the agricultural county agents, various State forestry agencies, or the Forest Service, United States Department of Agriculture.

The Federal Government is not authorized to distribute stock for forest planting, but under the provisions of the Clarke-McNary law it is cooperating with many of the State forestry departments in the growing and distribution of small trees for planting on farms for timber production or windbreaks.

Next to the improvement of existing woodlands by proper handling and good methods of marketing the products, no branch of farm forestry is of greater importance than forest planting (fig. 13).

ADDITIONAL INFORMATION

Additional information on various phases of forestry or timber farming can be had by writing to your State forestry department at the State capitol or to the extension service, State college of agriculture, or by applying to the county agricultural agent.

Federal publications on farm forestry include the following, which may be had at the prices indicated, in coin or money order, by addressing the Superintendent of Documents, United States Government Printing Office, Washington, D.C.:

Farmers in Northern States Grow Timber as Money Crop. (Farmers' Bulletin 1680). 5 cents.
The Farm Woods, a Savings Bank (Leaflet 29). 5 cents.
Making Woodlands Profitable in the Southern States (Farmers' Bulletin 1071). 5 cents.
Measuring and Marketing Farm Timber (Farmers' Bulletin 1210). 5 cents.
Sawfly Injurious to Young Pines (Farmers' Bulletin 1259). 5 cents.
Use of Logs and Poles in Farm Construction (Farmers' Bulletin 1660). 5 cents.
Forest Farming (Farmers' Bulletin 1794). 5 cents.
How to Cut Southern Farm Timber for Steady Profit (Leaflet 153). 5 cents.

[5] Refer to Farmers' Bulletin 1628, Growing Black Locust Trees. (Price 5 cents.)
[6] See Leaflet 84, Planting Black Walnut. (Price 5 cents.)
[7] Much practical information on what to plant and how to plant forest trees is found in Farmers' Bulletin 1123, Growing and Planting Hardwood Seedlings on the Farm (price 5 cents), and Farmers' Bulletin 1453, Growing and Planting Coniferous Trees on the Farm (price 5 cents).

Production of Maple Sirup and Sugar (Farmers' Bulletin 1366). 5 cents.
Pulpwood Crops in the Northeast (Leaflet 57). 5 cents.
More Turpentine, Less Scar, Better Pine (Leaflet 83). 5 cents.
Small Trees Wasteful to Cut for Saw Timber (Leaflet 55). 5 cents.
Planting Black Walnut (Leaflet 84). 5 cents.
Black Walnut for Timber and Nuts (Farmers' Bulletin 1392). 5 cents.
Growing Black Locust Trees (Farmers' Bulletin 1628). 5 cents.
Growing and Planting Coniferous Trees on the Farm (Farmers' Bulletin 1453). 5 cents.
Growing and Planting Hardwood Seedlings on the Farm (Farmers' Bulletin 1123). 5 cents.
Christmas Trees as a Cash Crop for the Farm (Farmers' Bulletin 1664). 5 cents.

FIGURE 13.—Forest trees needed to check soil erosion and make land bring an income.

The Windbreak as a Farm Asset (Farmers' Bulletin 1405). 5 cents.
Planting and Care of Shelter Belts on the Northern Great Plains (Farmers' Bulletin 1603). 5 cents.
Shortleaf Pine (Farmers' Bulletin 1671). 5 cents.
Loblolly Pine Primer (Farmers' Bulletin 1517). 5 cents.
Slash Pine (Farmers' Bulletin 1256). 5 cents.
Longleaf Pine Primer (Farmers' Bulletin 1486). 5 cents.
Southern Pine Beetle Serious Enemy of Pines in the South (Farmers' Bulletin 1586). 5 cents.
Chestnut Blight (Farmers' Bulletin 1641). 5 cents.
Nut Tree Propagation (Farmers' Bulletin 1501). 5 cents.
Basket Willow Culture (Farmers' Bulletin 622). 5 cents.
Trees for Roadside Planting (Farmers' Bulletin 1482). 5 cents.
Trees for Town and City Streets (Farmers' Bulletin 1208). 5 cents.
Planting and Care of Street Trees (Farmers' Bulletin 1209). 5 cents.
Propagation of Trees and Shrubs (Farmers' Bulletin 1567). 5 cents.
Transplanting Trees and Shrubs (Farmers' Bulletin 1591). 5 cents.
Pine Tree Treasures (Miscellaneous Publication 106). 5 cents.
Protect White Pine from Blister Rust (Miscellaneous Publication 22). 5 cents.
Currants and Gooseberries, Their Culture and Relation to Blister Rust (Farmers' Bulletin 1398). 5 cents.

FILM STRIPS ON FORESTRY

Film strips on many forestry subjects have been prepared by the Forest Service and Extension Service. These are available by purchase at prices ranging from 50 to 80 cents each, depending upon their length. For further information it is suggested that requests be addressed to the Chief, Forest Service, or Director, Extension Service, United States Department of Agriculture, Washington, D. C. Following are titles of available film strips (35 mm in width):

Farm Forestry in the South (64 frames).
Range Management on the National Forests (50 frames).
Forest Planting in the Northeastern States (39 frames).
4–H Forestry Club Work in New Hampshire (46 frames).
Keeping Livestock out of the Woods in the North Central States (55 frames).
National-Forest Playgrounds (74 frames).
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FORESTRY INCREASES FARM INCOME

BY

1. Making waste lands yield a profit by growing timber on
   - Poor soils
   - Steep slopes
   - Rocky lands
   - Wet lands
   - Unused corners
   - Eroded lands.
2. Furnishing paying employment for men and teams during the winter.
3. Utilizing timber better on the farm and avoiding waste by
   - Cutting low stumps and small tops,
   - Using substitute woods in construction,
   - Treating nonlasting woods.
4. Increasing crop yields by planting forest-tree windbreaks.
5. Growing more and better timber on the farm through
   - Protecting the woods from fire and overgrazing,
   - Selecting for cutting the mature, defective, overcrowded, and inferior kinds of trees, and leaving the straight, thrifty, and better kinds,
   - Planting to fill openings in woods.
6. Marketing the higher grades of wood products direct to consumers at fair prices as
   - Saw logs
   - Poles
   - Piling
   - Cooperage bolts
   - Handle bolts
   - Posts
   - Pulpwood
   - Firewood
   - Spoke blocks
   - Tannin bark.

MAKE YOUR WOODLAND PERMANENTLY PROFITABLE

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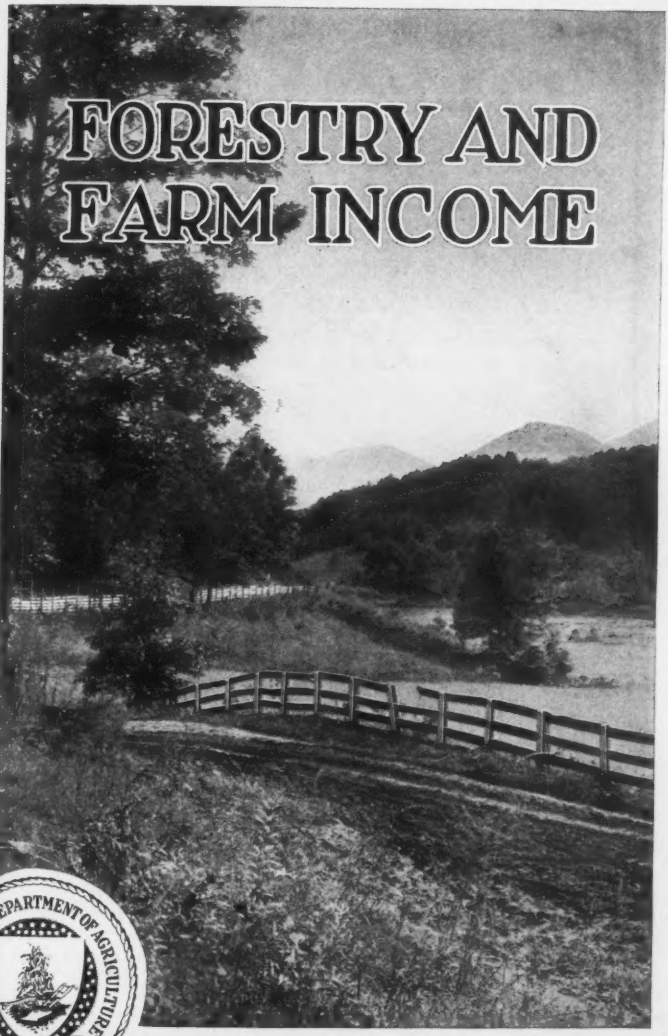
FORESTRY AND FARM INCOME



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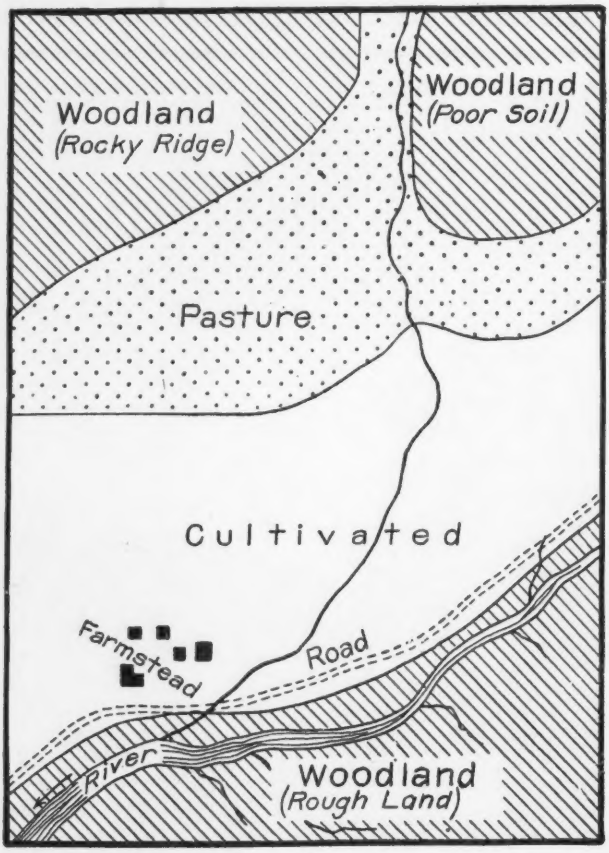
NO IDLE LAND ON THE FARM



Woodland on the hills, pasture land on the slopes, and cultivated land below

Washington, D.C.

Issued August 1920
Revised October 1940

FORESTRY AND FARM INCOME

By WILBUR R. MATTOON, *senior forester, Division of Private Forestry, Forest Service*

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WHY FARM FORESTRY PAYS

THE RIGHT HANDLING of forest trees on the farm will make it more prosperous, add to its comforts as a home, and enhance its value as an investment.

The home forest, in many sections of the country, will supply the timber which the farm needs for buildings, fences, fuel, repairs of all kinds, and many other uses; and there will often be a surplus which can be sold in the form of standing timber, saw logs, posts, poles, crossties, pulpwood, fuelwood, and blocks or billets for making spokes, handles, spools, boxes, barrels, and excelsior.

A well-cared-for home forest serves also as a windbreak for buildings, a shelter for livestock, a protection of valuable lands from erosion, a means of profitable employment for men and teams during otherwise spare or idle time, a place of recreation, and an improvement in the appearance of the farm.

Trees improve and build up the soil. The leaves, small twigs, and other tree litter decompose and form a layer of dark-colored vegetable mold, which enriches the soil and stores up soil moisture. By means of this layer of mold, the binding of the soil by the roots of the trees, and the resistance of the trunks to the rapid flow of water, the woods prevent floods from gullying or destroying the land by erosion, particularly on steep slopes.

Even if a farmer sells no timber the woodland pays. The firewood, fence posts, and material for repair and construction on the farm, the time and money saved by having them conveniently on hand, and the protection against extremes of weather afforded the crops, farm buildings, and stock are worth considerably more than the trouble and expense of raising and caring for the trees.

The woods need not occupy good farm land that will grow other crops. Trees are, as a rule, grown on the less fertile, stony, thin, or poorly-drained soils and on steep slopes. Unused corners and

small uncultivated spots about the farm are good places for rapid-growing, useful trees. The chief economic reason for timber growing on the farm is to get a money return from those portions which would otherwise be unproductive.

Though the land on which the farm forest is situated may not be suitable for other crops, it should not be treated as waste land (fig. 1). By comparatively little care it can be made to produce timber of value. Only a little attention is required, and this may be given in the winter or when other farm work is slack. Many trees that used to have slight value, and even small trees that used to be counted as brush to be got rid of, are now generally used for commercial purposes.

A permanent woodland is an essential part of a well-equipped farm; and more than ever before farm woodland has become a valuable asset convertible into money.

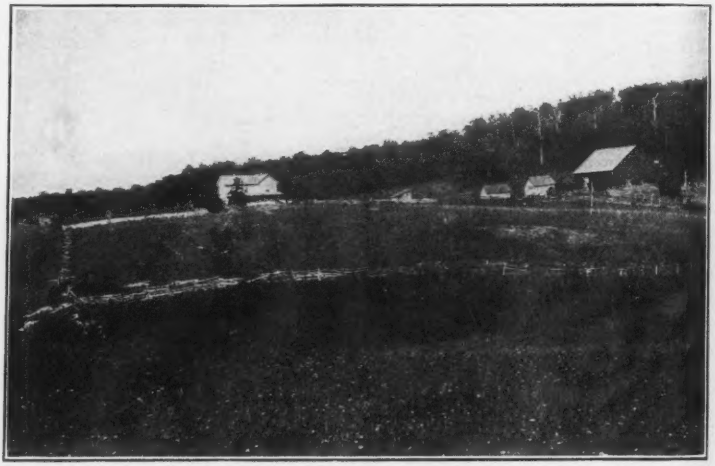

FIGURE 1.—Timber for the farm and for market, and shelter for the farmstead from woodland covering a stony ridge.

EXTENT OF FARM WOODLANDS

About one third of all the forest land of the United States is on farms. According to the 1935 census figures (table 1), this means that the farm woodlands amounted in all to about 185,000,000 acres. This is equivalent, roughly, to the aggregate area of New York, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, Ohio, Illinois, and Kentucky. If placed contiguously, they would form a solid strip 100 miles in width reaching from New York to a point one third the way across California.

The total woodland on farms east of the Rocky Mountains (fig. 2) amounts to 133,000,000 acres, or 89 percent of the total in the country. It covers an area as large as the entire forest lands of nearly all central and western Europe, including France, Germany, Switzerland, Austria, Denmark, Belgium, Netherlands, Poland, Czechoslovakia, Spain, Portugal, and Italy.

TABLE 1.—*Farm-woodland information, by regions and States, January 1935*

Region and State	Farm woodland area [1]	Farms [1]	Average woodland per farm (basis: all farms) [1]	Total land in farms [1]	Portion of farm in woodland [2]	Portion of forest land in State in farm woodland [1]	Increase in farm woodland last 5 years; [1] 1935 over 1930	Value of all farm-timber products in 1929 [2]
New England:	*Acres*	*Number*	*Acres*	*Acres*	*Percent*	*Percent*	*Acres*	*Dollars*
Maine	2,427,638	41,907	58	4,721,842	51.4	16.7	186,728	7,913,650
New Hampshire	1,273,826	17,695	72	2,115,548	60.2	28.3	201,825	3,063,363
Vermont	1,671,046	27,061	62	4,042,658	41.3	50.9	167,365	4,905,080
Massachusetts	1,027,724	35,094	29	2,195,714	46.8	31.4	165,155	2,981,126
Rhode Island	148,541	4,327	34	307,725	48.3	53.1	26,952	330,776
Connecticut	990,150	32,157	31	2,079,933	47.6	62.3	390,745	1,688,410
Middle Atlantic:								
New York	4,022,490	177,025	23	18,685,741	21.5	33.5	388,251	16,259,744
New Jersey	355,702	29,375	12	1,914,110	18.6	17.8	76,810	735,277
Pennsylvania	3,665,540	191,284	19	15,855,343	23.1	27.7	302,225	7,679,546
East North Central:								
Ohio	3,158,882	255,146	12	22,857,692	13.8	67.7	385,253	5,740,367
Indiana	3,064,187	200,835	15	20,518,745	14.9	88.4	444,707	5,375,846
Illinois	3,122,783	231,312	14	31,661,205	9.9	96.9	381,027	4,557,100
Michigan	3,816,124	196,517	19	18,459,922	20.7	18.6	581,385	8,801,817
Wisconsin	6,511,767	199,877	33	23,459,203	27.8	37.4	806,375	16,925,577
West North Central:								
Minnesota	5,383,250	203,302	26	32,817,911	16.4	24.6	636,947	10,756,988
Iowa	2,312,244	221,986	10	34,359,152	6.7	97.8	98,740	5,225,950
Missouri	8,902,997	278,454	32	35,054,542	25.4	50.6	1,202,997	11,850,371
North Dakota	575,435	84,606	7	39,118,136	1.5	99.0	17,693	486,550
South Dakota	635,709	83,303	8	37,101,871	1.7	32.9	145,152	544,705
Nebraska	934,237	133,616	7	46,615,762	2.0	85.6	−5,982	1,408,528
Kansas	1,233,036	174,589	7	48,009,770	2.6	98.0	123,530	2,306,529
South Atlantic:								
Delaware	234,511	10,381	23	921,251	25.5	72.2	30,813	419,876
Maryland	1,263,948	44,412	28	4,383,641	28.8	55.9	50,845	2,270,018
Dist. of Columbia	417	89	5	2,801	14.9	----------	−62	449
Virginia	7,670,354	197,632	39	17,644,898	43.5	50.7	975,198	12,028,661
West Virginia	3,570,151	104,747	34	9,423,655	37.9	35.9	441,601	4,070,330
North Carolina	10,094,743	300,967	34	19,936,307	50.6	47.9	1,768,309	15,184,145
South Carolina	5,690,873	165,504	34	12,329,958	46.2	45.0	1,788,338	5,824,378
Georgia	11,675,369	250,544	47	25,296,522	46.2	50.7	3,302,432	8,861,877
Florida	2,611,295	72,857	36	6,048,406	43.2	11.1	719,457	1,262,546
East South Central:								
Kentucky	5,421,246	278,298	19	20,698,510	26.2	51.5	624,620	6,662,901
Tennessee	6,206,217	273,783	23	19,085,837	32.5	43.6	792,870	13,021,166
Alabama	8,247,231	273,455	30	19,660,828	41.9	38.0	1,761,250	8,504,708
Mississippi	7,562,659	311,683	24	19,655,413	38.5	40.7	1,338,350	9,280,785
West South Central:								
Arkansas	6,527,466	253,013	26	17,741,627	36.8	29.5	1,084,211	7,769,391
Louisiana	3,427,431	170,216	20	10,444,288	32.8	18.0	768,318	3,231,438
Oklahoma	4,846,755	213,325	23	35,334,870	13.7	41.0	787,262	2,829,834
Texas	25,135,727	501,017	50	137,597,389	18.3	89.2	9,446,244	8,440,281
Mountain:								
Montana	1,773,877	50,564	35	47,511,868	3.7	8.6	−46,029	964,202
Idaho	951,281	45,113	21	9,951,661	9.6	4.2	91,373	938,979
Wyoming	596,015	17,487	34	28,161,911	2.1	7.1	80,372	279,396
Colorado	1,759,005	63,644	28	29,978,472	5.9	8.6	217,542	524,553
New Mexico	2,131,666	41,369	52	34,397,205	6.2	10.9	213,532	403,432
Arizona	1,123,684	18,824	60	14,018,540	8.0	10.9	213,532	382,006
Utah	219,857	30,695	7	6,239,318	3.5	2.6	28,521	35,749
Nevada	89,254	3,696	24	3,621,769	2.5	.8	22,881	53,056
Pacific:								
Washington	2,354,168	84,381	28	14,680,097	16.0	10.6	479,928	3,262,215
Oregon	3,349,944	64,826	52	17,357,549	19.3	11.1	227,729	3,908,087
California	5,706,513	150,360	38	30,437,995	18.8	19.8	1,203,758	2,090,486
Total or average	185,474,955	6,812,350	27	1,054,515,111	17.59	30.07	35,530,240	242,042,245

[1] 1935 census.
[2] 1930 census was the last to give these values.

The average acreage of woodland on farms in the United States is about 27 per farm. This amount varies widely, however, in the different sections of the country, ranging from 48 acres in New England to 17 in the West North Central States (table 2).

Farms contain more than one half the entire hardwood forest lands of the United States. On the farms of this country the woods occupy a larger portion of the total land area than any other crop; in fact as much as all the cereal crops combined.

In the New England States more than 20 percent of all forested lands is on farms, and in Ohio, Indiana, Illinois, and Iowa from 70 to 97 percent. In the Southern States the farms contain almost one half of all the forest lands, or a total of more than 110,000,000 acres. In Maryland, Virginia, Georgia, Kentucky, and Texas more than 50 out of every 100 acres of forest land is on farms.

Information concerning the areas of farm woodland, percentages of farmland wooded, total number of farms, and other subjects will be found by States in table 1 and by regions in table 2.

FIGURE 2.—Important farm woodland area east of the Rocky Mountains.

TABLE 2.—*Farm-woodland information by regions*

Region	Total woodland on farms	Average woodland on farms (basis: all farms)	Portion of farm in woodland	Farms	Total land in farms
	Acres	*Acres*	*Percent*	*Number*	*Acres*
New England (Maine, N. H., Vt., Mass., R. I., Conn.)	7,538,925	48	48.8	158,241	15,463,420
Middle Atlantic (N. Y., N. J., Pa.)	8,043,732	20	22.1	397,684	36,455,194
East North Central (Ohio, Ind., Ill., Mich., Wis.)	19,673,743	18	16.8	1,083,687	116,956,767
West North Central (Minn., Iowa, Mo., N. Dak., S. Dak., Nebr., Kans.)	19,976,908	17	7.3	1,179,856	273,077,144
South Atlantic (Del., Md., D. C., Va., W. Va., N. C., S. C., Ga., Fla.)	42,811,661	37	44.6	1,147,133	95,987,439
East South Central (Ky., Tenn., Ala., Miss.)	27,437,353	24	34.7	1,137,219	79,100,588
West South Central (Ark., La., Okla., Tex.)	39,937,379	35	19.9	1,137,571	201,118,174
Mountain (Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.)	8,644,639	32	5.0	271,392	173,880,744
Pacific (Wash., Oreg., Calif.)	11,410,625	38	18.3	299,567	62,475,641
Total or average	185,474,965	27	17.59	6,812,350	1,054,515,111

VALUE OF WOODLAND PRODUCTS

Considerable income may be derived from the home forest. The total value of forest products taken from timbered land on farms reported in the 1930 census, and shown in table 3, was $242,042,245.[1] Over half of this represents the value of wood and various minor wood products used on the farm and the rest the value of the products sold, or cut and held for sale. For the farms reporting (2,558,899, or 40.7 percent of all the farms), this amounted to an average of about $95 per farm.

The value of the various forest products cut yearly on farms in New England amounted to nearly $21,000,000. The same item for the 14 Southern States from Maryland to Oklahoma and Texas makes a total yearly value of over $105,000,000. Each of 7 States reported more than $10,000,000 as the value of forest products cut on their farms, as follows, beginning with the highest: Wisconsin ($16,925,577), New York ($16,259,744), North Carolina ($15,184,145), Tennessee ($13,021,166), Virginia ($12,028,661), Missouri ($11,850,371), and Minnesota ($10,756,988). They were followed by Mississippi, Georgia, Michigan, Alabama, Texas, Maine, and Pennsylvania, each of which cut forest products worth more than $7,000,000.

Saw logs and veneer logs, crossties, poles and piling, fence posts, pulpwood, and fuel wood are the chief timber products cut on farms (table 3). Nearly 41 (40.7) farms out of every 100 in 1929 (according to the 1930 census) cut some timber products. Fuel wood is an important item. In 1929 an average of 14 cords was cut per farm reporting, or a total for the country of 34,100,529 cords. Piled continuously, this would reach twice around the world at the equator

TIMBER GROWING IN THE EASTERN PART OF THE UNITED STATES PAYS BECAUSE—

1. There is plenty of cheap land unfit for agriculture.
2. The abundant rainfall permits rapid tree growth.
3. Transportation facilities by rail and water are good.
4. Numerous large cities furnish a market.
5. The region is far removed from the virgin supplies of the Pacific Northwest.

[1] The latest census values. These items were not included in the 1935 census.

and overlap for a distance of 1,600 miles. The total value was $151,245,458. Fence posts are essential on the farm, and the farmers cut 98,664,249, or an average of 174 per farm. The saw logs and veneer logs cut on farms in 1929 amounted to a total of 5,000,000,000 board feet. The value of this material at the farm was $47,637,752. Farms produce relatively smaller amounts of saw timber and more of the total cut of fuel wood, posts, crossties, and pulpwood.

TABLE 3.—*Quantities of various timber products cut on farms and their total values, by regions* [1]

Region	Kind of timber product						Value of all products
	Saw logs and veneer logs	Fuel wood	Pulpwood	Posts	Crossties	Poles and piling	
	Board feet	*Cords*	*Cords*	*Number*	*Number*	*Number*	*Dollars*
New England [2]	409,252,000	1,534,323	286,889	1,468,516	341,349	73,604	20,882,405
Middle Atlantic [2]	255,585,000	2,771,188	79,522	9,382,626	911,863	406,226	24,674,567
East North Central [2]	375,540,000	5,211,268	209,153	16,731,088	1,504,810	233,578	41,400,707
West North Central [2]	260,909,000	4,557,450	163,700	25,263,432	1,564,757	236,258	32,579,621
South Atlantic [2]	1,579,573,000	7,881,673	398,631	8,512,614	2,961,920	986,297	49,922,260
East South Central [2]	1,409,725,000	6,241,856	161,882	12,571,457	3,634,212	549,763	37,649,560
West South Central [2]	359,713,000	4,356,687	124,324	19,579,414	3,842,006	348,494	22,270,944
Mountain [2]	59,784,000	406,370	7,253	2,428,843	234,501	244,314	3,581,373
Pacific [2]	332,845,000	1,149,714	54,405	2,726,259	343,368	219,881	9,260,788
Total quantity	5,042,926,000	34,110,529	1,485,759	98,664,249	15,338,786	3,298,415	
Total value..dollars.	47,637,752	151,245,458	11,364,389	15,316,161	10,000,642	6,477,843	242,042,245

[1] Values by States are shown in table 1.
[2] For names of States included, see table 2.

Census of 1930.

SECURING GOOD FOREST GROWTH

At present farm woodlands are yielding, as a rule, only from one third to one half the wood they could grow. This is because only a few farmers realize the possibilities in their woodlands and give them proper care. As a result the home forest, which is close at hand, where comparatively little attention each year in protecting, cutting, and utilizing the timber would be very profitable, is in poor condition.

The amount of timber that an acre can grow in a year varies a good deal with the quality of the soil and moisture supply and the kind and number of the trees per acre. If fully stocked with trees and well cared for, an acre of hardwoods should grow yearly from about one half to one cord of wood and an acre of pine from one to two cords, a cord being equivalent to about 500 board feet of saw timber. Growth averages rather less in the northern part of the country because of the shorter season and somewhat more in the warmer southern part.

The chief essentials in keeping the trees growing are excluding fires and allowing the humus to collect on the forest floor. Large openings in the woods reduce the annual yield of timber and should not be allowed to occur. The length of time required to reach merchantable size varies with the kind of tree and the use to which its wood is to be put. Posts and crossties of some kinds may be grown in from 10 to 30 years, and most kinds of quick-growing trees will be large enough for saw timber in from 20 to 40 years.

After logging, a new stand of young trees generally starts naturally from seeds or sprouts from stumps. The natural seeding process in the woods can be helped by turning hogs into the woodland before the seed falls, or by harrowing the ground or conducting logging operations in a good seed year just previous to or shortly after

WOOD INSURES WINTER JOB

A farmer, settling on a quarter section of cut-over timberland in northern Wisconsin, reserved 70 acres for permanent woodland and cleared the rest. The natural timber was pine, spruce, and fir. After a few years he began cutting timber carefully, always leaving the thriftiest and best to grow. This was winter work for him and his sons.

During a period of 31 years he has kept a record of the amount of timber cut and the money received for it. The timber cut has amounted to 700,000 board feet of saw logs, which has brought him in an average gross return of $500 in cash yearly. Yet by his good management and cutting, the land at the end of the period (1932) has about 275,000 feet of standing timber.

The owner, in speaking of his forestry operations, admits that his woods have often been a source of temptation to him. "Many times in those earlier years", he said, "when cash was needed badly I was tempted to sell all the timber in one lump. But I did not do it. I knew that if I held on to my timber there would always be a winter job and some cash coming in. I am glad today that I never let it go."

the seed falls. By these means, the soil is stirred up, the seeds come in contact with it, and germinate more readily.

Some points to be remembered about trees which sprout are (1) the most thrifty sprouts come from clean, well-cut stumps felled during the late fall, winter, or very early spring before the sap begins to flow; and (2) the top of the stump should be cut smooth

so as to shed water. Trees which sprout successfully include such hardwoods as the oaks, hickories, chestnut, basswood, gums, cottonwood, and willows, and young shortleaf and pitch pines.

PINE POLES FROM AN OLD POTATO PATCH

A young man from Nebraska moved on to a small, poor, sandy-land farm in southern Mississippi. Two acres of abandoned land, worn out in growing potatoes and watermelons, came up in longleaf pine saplings. This "brush", as the neighbors called such patches, meant more to this young farmer from the treeless plains than to the local residents, and he protected the young trees from fire. Later when the neighbors, in a friendly spirit, advised him to cut and burn his saplings in order to avoid the State tax on growing timber he refused to take their advice.

The young trees grew rapidly under protection, and the land became covered with a crowded stand of tall, straight poles. One day a timber buyer came along the sandy road. He looked over the stand, which he found contained more than 1,000 merchantable poles, and offered the owner $600 for the standing trees. This was more "cash money" than the farmer had seen at one time in many years, and he gladly closed the deal at the buyer's figure, although at current stumpage prices the timber was worth considerably more money.

With no expense for labor or fertilizer, the farmer's timber crop yielded him a good net profit averaging $5 an acre yearly for a period of 35 years. The income might have been even greater had the harvesting been spread over a period of years by frequent light cutting.

Woodlands may also be restocked with young trees by planting out small seedlings grown in nursery beds or dug up in the woods, or under some conditions by sowing the tree seeds. If trees are

to be planted, it is well to select those native to the region which grow most rapidly and produce the most useful kinds of wood (fig. 3).

NUMBER OF TREES IN GOOD NATURAL STANDS

Often the question is raised as to how many trees there should be in a well-stocked natural stand, namely, one that is not too dense or too open. The number varies with the prevailing sizes or diameters of the trees and also with the kind, or species, of tree. Table

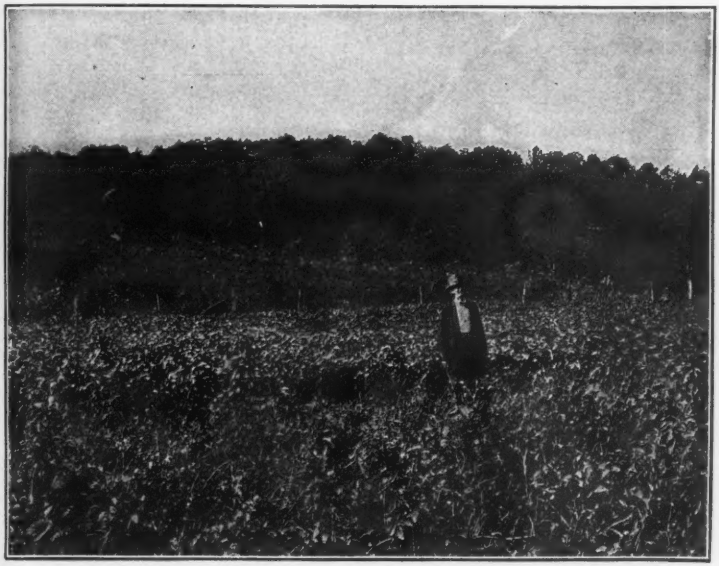

FIGURE 3.—Thrifty woods, good crops, and a happy farmer.

4, for example, shows the number of trees of different diameters and the total number of trees per acre for stands of four different groups or ranges of tree diameters. This holds generally good for natural stands of a good number of different kinds of trees in the eastern part of the United States. Those which demand much light, or are intolerant, such as the ash, black walnut, and red pine, must have an abundance of light and usually consume more soil moisture, and there should be somewhat fewer trees of these kinds per acre. Likewise trees such as the sugar maple, beech, yellow birch, and white pine, which can tolerate considerable shade, might stand closer together.

IMPROVING THE WOODS BY CUTTING

When rightly handled, a stand of timber yields continuous or repeated harvests. It should be cut with an eye to its continuous production on the land. The aim should be to keep the land producing timber of the best quality at the fastest rate.

TABLE 4.—*Approximate number of trees per acre in well-stocked stands composed of trees of similar diameter and different diameters* [1]

In stands where all trees have about the same diameter		In stands where trees have varying diameters				
		Trees per acre where the stand varies in size from—				Diameter of trees (breast high [2])
Diameter of trees (breast high [2])	Trees per acre	2 to 10 inches	2 to 14 inches	6 to 18 inches	10 to 24 inches	
Inches	*Number*	*Number*	*Number*	*Number*	*Number*	*Inches*
2	2,000	400	300	----------	----------	2
4	900	180	130	----------	----------	4
6	510	105	75	75	----------	6
8	320	65	45	45	----------	8
10	235	50	30	30	30	10
12	170	----------	25	25	20	12
14	130	----------	20	20	16	14
16	100	----------	----------	15	12	16
18	85	----------	----------	12	11	18
20	75	----------	----------	----------	9	20
22	65	----------	----------	----------	8	22
24	55	----------	----------	----------	7	24
Total	----------	800	625	222	113	----------

[1] Based on data compiled by the University of Michigan.
[2] Breast height is 4½ feet above the ground. Trees measured outside the bark.

Not all that is merchantable should be cut. In timber production on farms, it is not sufficient to leave only enough seed trees to restock the land. This would mean too long a wait between harvests.

TREES TO CUT FOR IMPROVING THE WOODS

Trees which are well suited for firewood and the removal of which will lead to an improvement of the remaining trees in the stand.

Trees which have been overtopped by others and have had their growth stunted.

Diseased trees, or trees seriously injured by insect attacks, or trees extremely liable to such injury; for example, chestnut in the region subject to blight or birch in the gipsy-moth area.

Badly fire-scarred trees.

Trees of the less valuable species, such as beech, birch, black oak, blackjack oak, or black gum, crowding the more valuable sugar maple, white or shortleaf pines, yellow poplar, or white oak.

Crooked trees and large-crowned, short-boled trees that will not make good lumber and that are crowding or overtopping others.

Slow-growing trees crowding fast-growing species of equal value.

Sound dead trees, both standing and down.

Mature trees that have reached their full growth.

There should always be plenty of younger trees as a good basis for growing later crops and also trees of larger sizes that can be cut at frequent intervals and keep up the cash income from timber.

Good management should result in a home forest fully stocked with sound, well-shaped trees of valuable and useful kinds that are growing as fast as possible. This can be brought about largely by "weeding", or cutting out the inferior kinds—the "weed" trees—for exactly the same reason that weeds are hoed out of the cornfield. The good trees need the light, space, soil moisture, and plant food that would otherwise be taken by the less valuable trees. Sometimes it becomes advisable to fill openings or improve the quality of the woods by planting seeds or seedlings of desirable kinds of trees.

FIGURE 4.—Woods improved by right cutting.

Dead and dying trees, diseased trees, deformed trees which shade out better ones, the less valuable kinds of trees, such as gray birch, aspen, blackjack oak, dogwood, sourwood, blue beech, ironwood, and others, and the less promising trees in crowded groups should be removed. The last operation is known as "thinning." By following these practices each year improvement in the forest is brought about in a relatively short time.

The wood removed in improvement cuttings often need not be a loss. It should be considered as an early crop that can be used or sold, generally at a price to show a profit on the work of thinning, while the woods are made more valuable by its removal (figs. 4, 5, and 6).

It is sometimes advisable to prune trees in forest stands, more especially in immature or younger stands of the more valuable kinds or in thrifty promising stands of any sort. The purpose is to clean the trunk of side branches, causing it to develop clear, high-grade

timber which commands higher prices. Such forest pruning began to be practiced first in New England with stands of white pine, where it has proved to be generally profitable. It is coming into good practice with farmers and other small owners in the Southern States on shortleaf, loblolly, slash, and longleaf pine; also on black

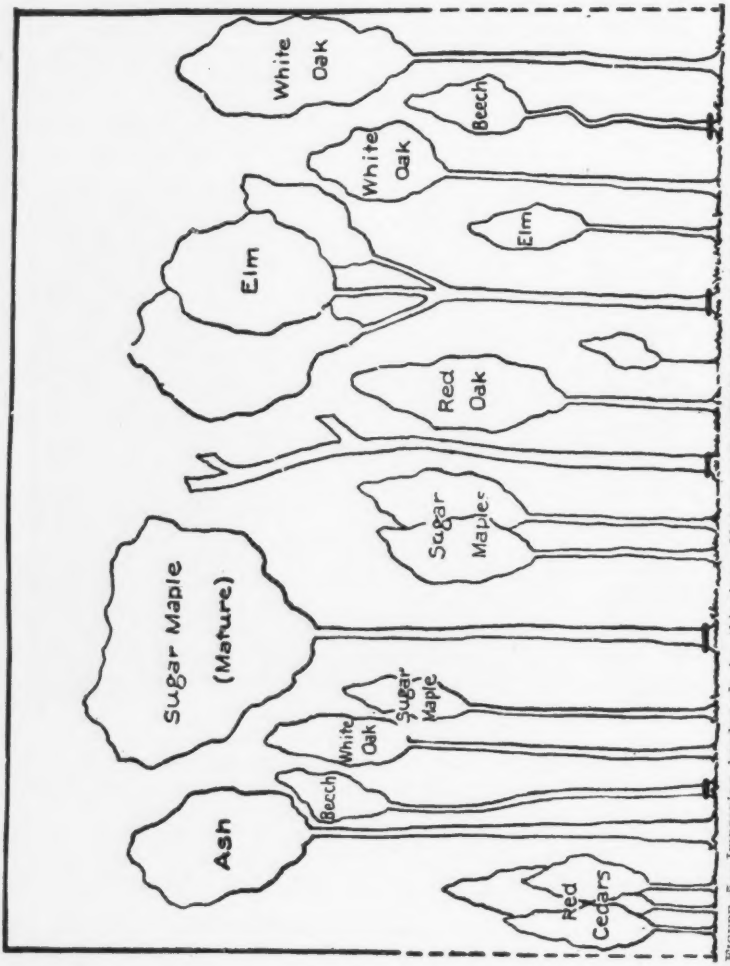

FIGURE 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species are marked at the base to be cut. A good stand will be left of thrifty middle-aged and promising young trees.

walnut, black locust, pine, and spruce forest plantations in the Central and Lake States.

Much more often than is commonly realized, grapevines and some other kinds of vines kill or stunt valuable trees, especially those that have rather open foliage like the black walnut, ashes, and locusts, and also trees standing in the open. The damage is caused by the

FIGURE 5.—Improving hardwoods by thinning. Mature and defective trees and inferior species are marked at the base to be cut. A good stand will be left of thrifty middle-aged and promising young trees.

FIGURE 6.—The growth and value of pine are increased by repeated thinning. The trees removed can generally be used or sold profitably for firewood, treated fence posts, or small timber: A, before thinning—15 overcrowded trees (shaded trees to be cut); B, the same stand 5 years later, after thinning—6 larger and more valuable trees (shaded tree to be cut).

vines spreading their leaves above those of the tree, which are thus shaded out, and as a result the tree becomes sickly or dies. This is an insidious form of damage, which often escapes notice. Therefore, cutting the vines should not be overlooked or neglected.

GOOD LOGGING

The right use of the ax and saw and the protection of the land from fire are the keys to the growing of timber profitably and perpetually as a crop. This right use comes from good judgment in the selection of trees to be cut and in cutting and logging carefully. Lack of proper care in these two essentials of protection and cutting has resulted in the ruin of many pieces of valuable timber-producing land.

The trees to be cut should each be selected in advance and marked, preferably by the use of whitewash or a cheap white paint. Blazing the trunks with an ax causes wounds in trees, which sometimes are left standing for long periods before being cut. Mistakes made in marking trees with an ax are not so easily remedied as those made with a brush.

Cutting should be done so as to cause the least possible injury or destruction to other living trees, particularly young trees. In felling trees advantage should always be taken of natural openings in the woods.

Stumps should be cut low—12 inches or less in height—thus taking the best timber, which is usually in the base of the tree. Cases are known in which enough good-grade timber has been left in high stumps to have paid for the entire cost of the logging.

Logs should be cut well into the tops of the trees. The upper log or logs usually will yield only low-grade lumber, but it should be utilized.

Advantage should be taken of crooks to cut the ends of logs at crooks rather than between them.

All brush should be pulled away from living trees in logging to lessen the fire damage and, in southern pines, also the menace of infestation of beetles, or so-called "worms." Care against the outbreak and spread of fire is of extreme importance.

In getting logs out of the woods care should be used to avoid all unnecessary injury or damage to living trees, both young growth and mature trees. The healing of wounds is a slow process, and wounds in the bark are often serious as they freely admit infection of disease and the attack of insects.

ESTIMATING AND SELLING TIMBER

When timber is no longer growing at a profitable rate it should be cut and used or sold. A farmer who is ready to sell timber would profit by measuring his trees, estimating how much saw timber or other product they contain, and making inquiry to find out how much they are worth. If he does not know or cannot find out how to do this, he should employ some experienced and reliable person to estimate and value his timber for him.

The customary units of measure in selling farm timber are board feet, cords, linear feet, and the piece. A board foot, for example,

is 12 inches long, 12 inches wide, and 1 inch thick, or its equivalent. The standard cord of wood is 4 feet high, 4 feet wide, and 8 feet long. The linear foot is a measure of length only, without regard to the other dimensions of the material. Piece measure is only a count of the pieces in any form in which the wood is sold.

FIGURE 7.—Fast-growing hickory is in demand for implement handles and spokes.

Logs and standing trees are usually estimated in board feet. Saw timber is measured in board feet. Round timber, such as poles and piling, is usually sold by the linear foot. Firewood, pulpwood, and wood cut in short lengths for distillation, handle stock (fig. 7), and other uses are usually sold by the cord. Fence posts, ties, telephone poles, and some other forms of timber are sold by the piece.

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Saw timber in the standing tree is estimated by measuring the diameter of the tree, outside the bark, at breast height (4½ feet above the ground), and measuring or estimating the height of the tree. When these measurements are known, the contents of the tree can be found from a volume table.[1] Often the length of the part of the trunk to be used is taken in units, or number of 16-foot logs, instead of the total height of the tree.

A volume table is one showing in board feet the amount of timber that can be sawed from trees of given heights and diameters or from a given number of merchantable logs and diameters. For example, a volume table for white oak would show that a tree 18 inches in diameter (measured outside the bark at breast height) and having three merchantable 16-foot logs will saw out 286 board feet of lumber. Volume tables are made for different kinds of trees, each table based on the average of many measures of felled trees.

[1] For volume tables and other information on estimating and measuring timber, see Farmers' Bulletin 1210, Measuring and Marketing Farm Timber (price 5 cents), or apply to State foresters.

TEN HELPS IN MARKETING WOODLAND PRODUCTS

1. Get a reliable estimate of the amount and value of the timber to be sold. If necessary get experienced help. Know what you want to sell.

2. Before selling, consult neighbors who have sold timber, and benefit from their experiences.

3. Investigate local timber requirements and prices. Your products may be worth more locally because transportation is saved.

4. Get prices for various wood products from as many sawmills and other wood-using plants as possible.

5. Advertise in papers and otherwise secure outside competition.

6. Secure bids, if practicable, both by the lump and by log-scale or other unit measure.

7. Be sure that you are selling to responsible purchasers.

8. Market the higher grades of timber and use the cheaper for farm purposes.

9. Remember that standing timber can wait over a period of low prices without rapid deterioration.

10. Use a written agreement in selling timber, especially if the cutting is to be done by the purchaser.

A saw log is measured by taking the length of the log and its diameter inside the bark at the small end, then employing a log rule to estimate the amount or number of board feet it contains. A log rule is a statement of the estimated number of board feet of lumber that can be sawed from logs of different lengths and sizes. A good rule for 12-foot logs is to multiply the diameter inside bark at the small end by half the diameter. For shorter logs the contents will be proportional to the length of the logs. Thus, a 12-foot log 16 inches in diameter will saw out about 16 × 8 or 128 board feet, while a 10-foot long log 14 inches in diameter will cut $\frac{10}{12}$ of 14×7, or 81⅔ board feet.

It is very important to consider what log rule is to be used, because much depends upon it in measuring and selling timber. There is a great difference in the amount of timber and likely often in the resulting money return.

The International rule (table 5) gives log volumes that closely approximate what can be sawed out by using good methods. Owners of small logs for sale will benefit when this or some equally close rule has come into general use.

TABLE 5.—*The contents of logs, in board feet, scaled by the International log rule, by using saw cutting ¼-inch kerf*

Diameter at top end of log, inside bark (inches)	Contents in board feet of logs having a length of—												
	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet	19 feet	20 feet
6	10	10	10	10	15	15	15	20	20	20	25	25	25
7	10	15	15	15	20	20	25	25	30	30	35	35	40
8	15	20	20	25	25	30	35	35	40	40	45	50	50
9	20	25	30	30	35	40	45	45	50	55	60	65	70
10	30	35	35	40	45	50	55	60	65	70	75	80	85
11	35	40	45	50	55	65	70	75	80	85	95	100	105
12	45	50	55	65	70	75	85	90	95	105	110	120	125
13	55	60	70	75	85	90	100	105	115	125	135	140	150
14	65	70	80	90	100	105	115	125	135	145	155	165	175
15	75	85	95	105	115	125	135	145	160	170	180	190	205
16	85	95	110	120	130	145	155	170	180	195	205	220	235
17	95	110	125	135	150	165	180	190	205	220	235	250	265
18	110	125	140	155	170	185	200	215	230	250	265	280	300
19	125	140	155	175	190	205	225	245	260	280	300	315	335
20	135	155	175	195	210	230	250	270	290	310	330	350	370
21	155	175	195	215	235	255	280	300	320	345	365	390	410
22	170	190	215	235	260	285	305	330	355	380	405	430	455
23	185	210	235	260	285	310	335	360	390	415	445	470	495
24	205	230	255	285	310	340	370	395	425	455	485	515	545
25	220	250	280	310	340	370	400	430	460	495	525	560	590
26	240	275	305	335	370	400	435	470	500	535	570	605	640
27	260	295	330	365	400	435	470	505	540	580	615	655	690
28	280	320	365	395	430	470	505	545	585	625	665	705	745
29	305	345	385	425	465	505	545	590	630	670	715	755	800
30	325	370	410	455	495	540	585	630	675	720	765	810	855

The Doyle rule (table 6), although very inaccurate for small-sized timber, is probably most commonly used in the United States. To determine the number of board feet in a log by this rule, deduct 4 inches from the diameter of the small end, then square one fourth the remainder and multiply the product by the length in feet.

For example, a log measuring 20 inches at the small end and 12 feet long contains 192 feet. The Doyle rule, in many sections the standard and in some States the legal rule, is unfair to the seller for measuring logs below 28 inches in diameter. In the early days of large cheap timber it was fairly satisfactory, but for small-sized timber it gives such low values as to make it unsatisfactory. The Scribner rule is fairer than the Doyle. Careful sawing, however, should result in 10 to 20 percent more lumber from second-growth timber than is credited by the Scribner rule.

TABLE 6.—*Doyle log rule*

Diameter of log at small end and inside bark (inches)	Contents of log in board feet when length of log is—												
	6 feet	7 feet	8 feet	9 feet	10 feet	11 feet	12 feet	13 feet	14 feet	15 feet	16 feet	17 feet	18 feet
6	1	2	2	2	2	3	3	3	3	4	4	4	4
7	3	4	4	5	5	6	7	7	8	8	9	10	10
8	6	7	8	9	10	11	12	13	14	15	16	17	18
9	9	11	12	14	16	17	19	20	22	23	25	27	28
10	13	16	18	20	22	25	27	29	31	34	36	38	40
11	18	21	24	28	31	34	37	40	43	46	49	52	55
12	24	28	32	36	40	44	48	52	56	60	64	68	72
13	30	35	40	46	51	56	61	66	71	76	81	86	91
14	37	44	50	56	62	69	75	81	87	94	100	106	112
15	45	53	60	68	76	83	91	98	106	113	121	129	136
16	54	63	72	81	90	99	108	117	126	135	144	153	162
17	63	74	84	95	106	116	127	137	148	158	169	180	190
18	73	86	98	110	122	135	147	159	171	184	196	208	220
19	84	98	112	127	141	155	169	183	197	211	225	239	253
20	96	112	128	144	160	176	192	208	224	240	256	272	288
21	108	126	144	163	181	199	217	235	253	271	289	307	325
22	121	142	162	182	202	223	243	263	283	304	324	344	364
23	135	158	180	203	226	248	271	293	316	338	361	384	406
24	150	175	200	225	250	275	300	325	350	375	400	425	450
25	165	193	220	248	276	303	331	358	386	413	441	469	496
26	181	212	242	272	302	333	363	393	423	454	484	514	544
27	198	231	264	298	331	364	397	430	463	496	529	562	595
28	216	252	288	324	360	396	432	468	504	540	576	612	648
29	234	273	312	352	391	430	469	508	547	586	625	664	702
30	253	296	338	380	422	465	507	549	591	634	676	718	760

In finding a buyer for his timber the owner should inquire of his neighbors who have sold, or at local sawmills, wood yards, wood-using factories, railroad stations, and telegraph and telephone companies. He should also advertise in the papers and write personal letters furnishing a brief description of the kind, quality, and amount of timber for sale, in order to awaken competition among local and outside buyers. Securing a number of bids for the same piece of timber will tend to develop the best market and increase returns. It is well to have a written agreement as to the manner in which the timber shall be cut, and the amount and form of payment [2] (fig. 8).

Some of the industries buy their supplies largely or wholly in the log; hence, in many cases it will pay the farmer to look up these special markets for his logs, bolts, poles, ties, etc. Industries buying their supplies more or less generally in the form of round timber are manufacturers of handles, cooperage, veneer, woodenware and novelties, shuttles, bobbins and spools, vehicle stock, athletic goods, and pulpwood. Poles are purchased by electric-lighting, power, and tele-

[2] For further information see Farmers' Bulletin 1210 (price 5 cents), or apply to your State forestry agencies.

phone companies. Markets for piling will be found by applying to railroads, wharf, bridge, and bulkhead contractors in the larger towns and cities. For prices on ties, consult the nearest local railroad station agent. Cordwood is used by brickmakers, bakeries, limekiln operators, and fuel dealers in towns.

FIRE PROTECTION

The forest must be protected. Fire, careless logging, tree diseases, insect pests, and, in the hardwoods, grazing are the principal sources of injury.

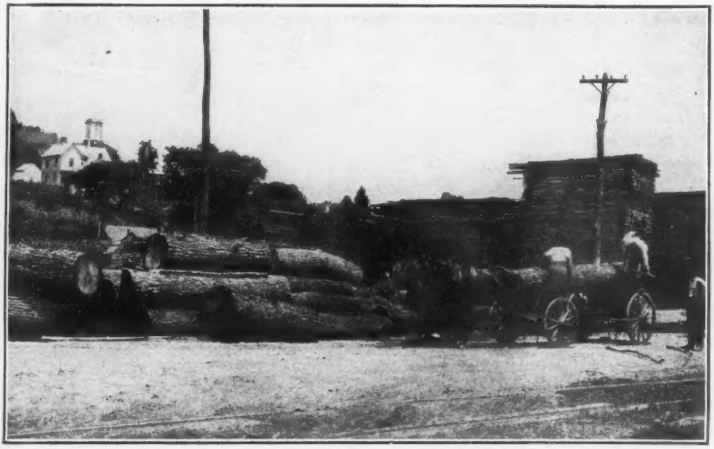

FIGURE 8.—Choice logs bring high prices and are often shipped long distances.

Fire kills the little trees and weakens full-grown trees so that they may become diseased or infested with insects. It also destroys the humus cover of leaves and twigs that ordinarily protects the trees against summer drought and heat, conserves water for the springs and streams, and enriches the soil by adding nitrogen.

HELP PREVENT WOODS FIRES

BE SURE your match is out before throwing it away.

DON'T throw away burning tobacco.

CHOOSE a safe place and make your camp fire small.

PUT OUT your fire with water and then cover it with earth.

DON'T make large brush heaps. Choose a still day for burning, and plow furrows to protect near-by woods.

BE CAREFUL WITH FIRE

Dead trees and tops cut in logging are a fire menace and should, if possible, be utilized. Saw logs or firewood can be made out of the dead trees, and the unused large tops should be lopped so that they will lie close to the ground and rot quickly.

Some idea of the prevalence of fires in the United States east of the Rocky Mountains may be formed from the fact that here occur 90 out of every 100 forest fires. For the 5 years 1931 to 1935, inclusive, an average of 150,698 fires yearly in this region burned over 39,371,690 acres of land and caused an enormous property loss. While fires were reported from all States, a greater number of fires occurred in the southern pine district than in any other important forest region.

Practically every State has strict laws against the setting of fire and carelessness in the burning of brush. In a number of States the railroads are required to use efficient spark arresters in their locomotives and burn fire lines along their rights of way.

Forest fire protective systems have been established by most of the States cooperating with the Federal Forest Service under the provisions of the Clarke-McNary Act. Patrolmen are employed who travel through the districts where there is danger of forest fires, watch for fire, and educate the public in the need for care in preventing fire and for getting quickly to any fire that may occur. Owners of woodland should get in touch with the State foresters and fire patrolmen, and secure their cooperation and assistance in keeping down fire hazard and damage.

GRAZING AND INSECT DAMAGE

Horses and cattle eat and break down young trees and pack the ground hard. Sheep and goats destroy large numbers of small trees by eating them. Hogs root up the ground, digging up the young trees and roots and sometimes eating the roots. They also prevent young trees from starting by devouring the nuts and other seeds from which they grow. On the other hand, however, trees bearing small or unpalatable seeds often start well after hogs have rooted up the leaf litter and soil.

Some people fear that good pasture will be wasted by keeping stock out of the woods. This is hardly true, since a fully stocked woodland has little or no grass in it, for the reason that there is insufficient light (fig. 9). Studies in farm management in northwestern Pennsylvania show that an open stand of trees, such as occur in average wooded pastures, reduces the pasturage value of the land as much as 65 to 70 percent.[3] Grass in the woods is a sign that the stand is in poor condition and that the trees are too far apart for growing a good quality and large amount of timber. This does not apply in the southern longleaf pine region or in some of the western forests, where much good timber occurs in open stands. Grass grown under the shade of trees is less nutritious than that grown in the open, so its actual food value is small.

Plenty of shade for livestock should be provided in pastures, but pasture land and woodland are most profitable when managed separately, each for the growing of its own individual product.

[3] U. S. Department of Agriculture Bulletin 853, The Organization and Management of Farms in Northwestern Pennsylvania. (No longer available for distribution but may be consulted in most libraries.)

Woodland may be guarded against serious insect damage and disease by removing dead or dying trees and all those showing signs of insect attack or decay. In the South, pine should be cut in the cool part of the year. When it is cut in the summer, bark beetles and wood borers injure the cut trees, multiply rapidly, and spread to living trees, which they often kill by eating the rich inner bark for food. A special treatment for weevil-infested white pine has been developed. In cases of insect menace or injury it would be best to get into communication with the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, or the State entomologist.

FIGURE 9.—Little or no grass grows in a fully stocked woodland.

USING TIMBER AT HOME

Lack of knowledge of the proper use of timber is one form of farm mismanagement.

It is a mistake to saw up choice logs of white oak, ash, cherry, and yellow poplar for rough uses at home, or to use clear black walnut for gate boards, or split up white oak butts for fence posts (fig. 10). Many valuable logs go into crossties, when they would bring the owner much more if sold as saw logs. Large numbers of young, rapid-growing trees, producing only one small tie, are cut, which, if left to grow for from 3 to 5 years, would more than double the profit.

Cutting is commonly done promiscuously without regard to continuing the future productiveness of the woodland, and large amounts of timber are commonly wasted in high stumps and long tops.

The importance of the home forest as a reserve for "pinch" times cannot be overestimated. In the period of business reorganization beginning in about 1930, for example, communities and individual farms having local supplies of standing timber were in a favorable condition since lumber, pulpwood, ties, poles, and especially fuel wood, kept moving although in restricted amounts. Farmers with

such supplies also had materials for repair of farm buildings and necessary new construction.

Timber that is cut in the late spring and summer months should be handled with special care to avoid injury. This is because freshly cut wood is then more likely to be attacked by insects and fungi than during the cold part of the year. Seasoning also proceeds more rapidly during the warmer season and may cause excessive checking. If rightly handled, posts, poles, and logs may be cut at any season without their durability being affected. In no case should wood be allowed to lie in direct contact with the ground. The opportunity for insect attack and decay can be reduced to a minimum by peeling

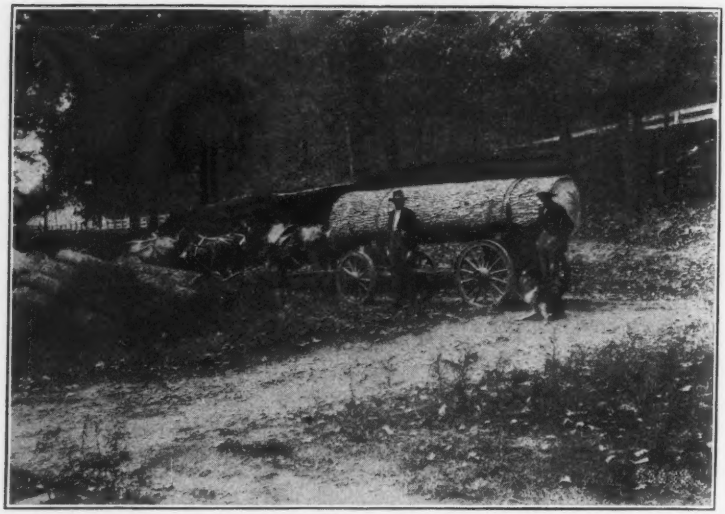

FIGURE 10.—Because they split easily, clear white oak butt logs have been worked up into fence posts when several farmers could have jointly shipped a carload at fancy prices.

the timbers and open-piling them off the ground in a shaded but dry place. This, however, does not retard checking of the wood.

Logs are sometimes stored under water in the hot season to prevent blue stain, checking, insect attack, and decay. Painting the ends of logs with a yellow ocher or barn paint will very materially retard injury by end checking. Painting peeled timbers with creosote will prevent sap stain and decay.

Well-seasoned fuel wood makes more heat and saves time and worry in the home. Thus a woodshed may be a good investment in more ways than in money saving.

TREATING FENCE POSTS

Every farm needs fence posts, but relatively few have sufficient supplies of lasting wood to meet home needs. This is particularly true in the Middle West and South. By means of a simple method of treating timber in open tanks with coal-tar creosote, the post and

pole problem can be readily solved. By this process such short-lived woods as soft maple, beech, birch, sweet gum, black gum, young or sap pine, and red oak are made durable for use in the ground for 10 to 30 years (table 7).

TABLE 7.—*Relative economy of treated and untreated fence posts* [1]

	Untreated sap pine	Untreated white or post oak	Creosoted sap pine
Cost of post	$0.05	$0.21	$0.08
Cost of treatment			.25
Cost of setting	.15	.15	.15
Total cost of post in ground	.20	.36	.48
Average life of post	[2] 2	[2] 6	[2] 15
Average yearly cost	0.10	0.06	0.03⅓
Average yearly cost of 1 mile of fence (posts 1 rod apart)	32.00	19.20	10.24

[1] The costs of materials and labor should be regarded as showing relative rather than absolute values.
[2] Years.

The treating of fence posts is an unusually favorable project for cooperation on the part of several farmers. This refers especially to buying equipment and supplies of coal-tar creosote.

A comparison of the annual costs of maintaining four fences built with posts of untreated sap pines, untreated white or post oak, treated white or post oak, and treated sap pine, respectively, indicates a saving of $8 to $23 per mile in favor of the treated pine.

Although more expensive at the outset, creosoted posts are generally more economical to use than many kinds of untreated, short-lived woods, because of their much greater lasting qualities. The exceptions would be in remote localities with cheap wood and labor and where it would be expensive to obtain creosote. The large saving in the replacement charges, which ordinarily mount up so high in maintaining a fence, and the use of cheap and inferior kinds of wood in the first place, much more than offset the increased cost of thorough treatment with creosote (fig. 11). Treated posts are a good investment, and their use where lasting woods are scarce or expensive is a sign of sound judgment in farm management.

Cutting and seasoning.—It is important that the timber be peeled and thoroughly seasoned before an attempt is made to treat it. Small flakes of inner bark left on the wood prevent proper absorption of the preservative at those places. Peeling is done most easily during the spring months, but is carried on at other seasons of the year. The posts to be treated should be peeled from 3 to 4 months, depending upon the weather, before treatment, and open-piled in a dry situation to effect proper seasoning.

Kinds of posts.—Because they have a uniform absorbing surface of sap wood, round sticks are more satisfactory than split timber for treatment. It is not profitable to treat lasting woods, such as red cedar, black locust, chestnut, and white oak. Practically all of the softwoods or sapwoods may be treated and profitably used as posts.

Small-sized timber.—When treated timber is used it is not necessary to cut the large-sized line posts commonly employed untreated in the past. A post from 2 to 3 inches in top diameter, long enough

to allow only a few inches above the top wire, costs less for creosoting and labor in handling, lasts as long as larger-sized timber, and possesses ample strength for ordinary fences. Small-sized trees are abundant in second-growth timber, often being crowded out by more vigorous neighboring trees. Cutting these for fence posts utilizes the forest product that would often otherwise be wasted, improves

FIGURE 11.—The treating of nondurable timber brings many kinds of wood into new forms of utilization. (Photo by courtesy of Iowa State College of Agriculture.)

the remaining stand, and furnishes profitable employment on the farm during slack time.

Kind of treatment.—The application of creosote by brushing over the whole post is only slightly effective in preventing decay, and rot often starts in small cracks which are not reached by the brush, or in checks which soon develop while the post is in use. Open-tank treatment with a hot bath followed by a cold bath is recommended for fence posts. The sapwood surrounding the heartwood takes treatment readily and is thereby protected against the entrance of decay.

Preservative.—It is important to use a good preservative, and coal-tar creosote has been found to be by far the most satisfactory material. Ordinary gas tar or coal tar has been used more or less, but it is usually too thick even when treated to give a fair degree of penetration.

Treating.—The best treatment is that which results in the deepest penetration into the wood with the least absorption of creosote. The butts of the posts should be placed for 1 to 2 hours in creosote heated to a temperature of 180° to 220° F. It is important to treat the wood to a height of a foot above the proposed ground line. In the Southern States the entire post should then be submerged into cold oil, 80° to 100°, for 1 to 2 hours, or for such time as is necessary to get a good penetration. In the North, where decay is less rapid, the cold treatment is applied usually to the butts only, the tops being treated by painting or dipping in creosote.

A satisfactory outfit for treating posts successfully consists of an upright cylindrical tank for the hot treatment and a horizontal rectangular tank for the cold bath.

A saving in cost can be made by two or more farmers joining together in the purchase and use of treating tanks. In a number of instances this has proved to be a successful form of cooperation.

PLANTING FOREST TREES

The profitableness of forest planting cannot be laid down by any rule, since it is subject to very wide variation. Rapid-growing trees of good, standard value can often be grown profitably by farmers on portions of worn-out or idle lands or as a commercial enterprise on cheap lands located relatively near good markets. Examples may be cited of white and red pines in New England, black locust and black walnut in many districts of the eastern part of the United States, and shortleaf, loblolly, longleaf, and slash pines in the Southern States.

White pine, especially when planted in mixture with hardwoods, and red pine are among the most promising crops for large areas of the Northeastern States. The largest known reforestation operation undertaken by an individual private landowner is one carried on in the upper portion of the Hudson River in eastern New York, where one owner has planted about 5,500 acres, using a total of 5,473,600 small trees, mostly white, red, and Scotch pines and Norway spruce. In the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, Minnesota, and elsewhere the white pine blister rust is present, and planters of white pine should protect it from this disease by destroying all wild and cultivated currants and gooseberries within 900 feet of the plantation. These bushes are the alternate hosts of the blister rust and if they are permitted to remain near native or planted white pines in localities where the blister rust is prevalent the trees become diseased and gradually die. Usually the cost of uprooting wild currant and gooseberry bushes is small.[4]

Large areas of fine young forest stands have been established in the South by setting out 1-season-old seedlings of the four important

[4] For further information relative to protection from blister rust consult your State forester or the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

RETURNS IN GROWING TIMBER IN NEW HAMPSHIRE

This white pine was planted on an abandoned sidehill pasture of about 3 acres in New Hampshire. At the age of 44 years (shown in the illustration) it contained about 90,000 board feet of lumber. The total outlay at the time, counting the value of the land and labor of planting, was $35. The timber was worth on the stump something over $1,500 at the high prices prevailing when the above picture was taken.

The farmer had this strip of practically worthless sidehill, and with some spare time on hand dug up 1,400 seedling pines growing in a thicket and set them out. About 20 years later the farmer died and among his assets was this small tract of young pine for which, much to her surprise, the widow was offered $300. The second owner retained it for about 15 years and then, wishing some money, sold it. Soon afterwards it came into the hands of the third owners, a lumber company, for something over $1,000.

Assuming a land value of $5 per acre, and a charge for taxes and oversight for the period averaging $2 per acre per year, the operation yielded a return of 5 percent on the total investment in land, labor, and annual outlay, and in addition a neat sum equivalent to a yearly net profit from the start of $2.34 per acre. To get this return required favorable markets.

kinds of pines. The largest such young planted forest is located in southeastern Louisiana, where a lumber company has planted 30,000 acres. Hundreds of farmers in the South are turning worn-out farm lands into timber production by planting yearling pines. In the piedmont the pines are mostly the shortleaf and loblolly, and in the lower piedmont and Coastal Plain they are the slash and longleaf pines. Both of the latter trees yield crops of crude turpentine, from which spirits of turpentine and rosin are produced. Owners often say that the return from the "gum" is double that obtained later from the timber.

Of the two trees, the slash pine is more extensively planted because of its very rapid growth when young and its heavy yield of gum or crude turpentine. One farmer in south Georgia has reforested about 2,000 acres of his worn-out cotton fields by planting slash pine seedlings at the rate of about 750 per acre, or a total of 1,500,000 trees.

In rich agricultural belts the planting of forest trees on a large scale for direct money returns would undoubtedly prove to be a losing investment. There, however, considerable forest planting goes on, but on relatively small, isolated tracts on farms and for special purposes, depending upon local conditions. Forest trees are planted chiefly to check soil erosion on slopes; to afford a windbreak as shelter for growing crops, livestock, and man; to produce Christmas trees; and to utilize to the best advantage rough, stony, or poor soils and inaccessible and wet lands. Black walnut is one of the best trees to plant in good soil over much of the region.

In western Tennessee, where the soil is a very deep, rich, clay loam, known locally as "brown loam", the planting of black locust trees has been extensively pushed by the State as a means of reclaiming and making profitable badly eroding lands and at the same time checking at the source of the small streams the silting which results in expensive dredging operations on the Mississippi River and its navigable tributaries. Similar conditions prevail over large areas in other States of the Mississippi Basin and in the piedmont and lower slopes of the Appalachians.

On the farms of the eastern part of the United States many thousands of acres of slopes, from which the forest should never have been removed, have been cleared and have become waste. Careful cutting by the selection method would have resulted in keeping the land continuously productive. This mistake is still going on in some rural sections where foresight and study have not yet been generally applied to farm management.

Forest-tree planting is practicable as a means of putting idle land to producing, checking soil erosion, regulating stream flow, and improving the quality of woodlands by increasing the quantity and value of their product. Through carelessness, cutting, fire, and other agencies, many woodlands have fallen far below their maximum capacity of production. By the application of a little intelligent guidance in making proper improvement cuttings and by affording protection from grazing animals and fire, it is often possible within the period of a few years to bring about a marked change for the better in the composition and quality of the woodland. This method

often succeeds even better than planting trees. This is illustrated by the experience of woodland owners. A progressive farmer in Summit County, Ohio, wishing to handle his woodlands rightly, excluded all livestock by fencing and at the same time planted catalpa in the larger openings in his woods. In 10 years the forest floor, instead of being bare and packed hard, consisted of a deep layer of spongy organic matter, affording protection to the roots of the trees. A complete understory of young yellow or tulip poplars, hard maple, beech, elm, white oak, hickory, and ash had sprung up. The volunteer poplars had grown to from 6 to 12 feet in height and completely overtopped and suppressed the planted catalpa. Inasmuch as the poplars were the more valuable of the two species

FIGURE 12.—Black locust planted on waste land, supplying the farm with fence posts and enriching the soil.

because of their rapid rate of growth and the useful quality of the lumber, nature had beaten the owner at his own game. By making proper thinnings, then, in 5 years the woodland was brought to the very satisfactory condition of having a good stand of valuable species of trees filling all the openings and coming on to take the place of the mature trees as cut.

In choosing species for planting it is always best to consider first the most desirable kinds of native trees, since they are already acclimated to the local conditions and are least subject to failure. In general, the various conifers, including the pines, are to be recommended for planting in most sections of the country because they are quick-growing and yield softwood, which is in more demand than the hardwoods. Cottonwood, which is known for its rapid production of wood, is a good tree for relatively moist situations on good soil. Black locust takes root quickly on dry slopes and possesses to a marked degree the ability to hold the soil against agents of erosion (fig. 12). It is somewhat limited in its range of successful growth by a locust boring beetle, which, however, can be con-

trolled to some extent by means of proper spacing and handling of plantations.[5] Black walnut is probably one of the best kinds of trees for the farm, owing to the high quality and value of its wood and its production of edible nuts. They should never be planted in close formation but in widely spaced orchards or small groups and only on good agricultural soils.[6] The more desirable trees for the farm to be favored in planting over a large region of the eastern States include also the red and white pines, European larch and Norway spruce in the northern States, and shortleaf, loblolly, longleaf, and slash pines in the southern States, and yellow (or tulip) poplar and black locust in the eastern uplands and mountains.[7]

The planting of forest trees for shade, nut production, and ornamental purposes, as the original timber becomes scarcer, has a place of increasing importance on our farms and likewise in the towns and cities.

Information regarding the kinds of trees, ways of obtaining seed or seedlings, methods of sowing and planting, and the care of trees can be had upon application to the agricultural county agents, various State forestry agencies, or the Forest Service, United States Department of Agriculture.

The Federal Government is not authorized to distribute stock for forest planting, but under the provisions of the Clarke-McNary law it is cooperating with many of the State forestry departments in the growing and distribution of small trees for planting on farms for timber production or windbreaks.

Next to the improvement of existing woodlands by proper handling and good methods of marketing the products, no branch of farm forestry is of greater importance than forest planting (fig. 13).

ADDITIONAL INFORMATION

Additional information on various phases of forestry or timber farming can be had by writing to your State forestry department at the State capitol or to the extension service, State college of agriculture, or by applying to the county agricultural agent.

Federal publications on farm forestry include the following, which may be had at the prices indicated, in coin or money order, by addressing the Superintendent of Documents, United States Government Printing Office, Washington, D.C.:

Farmers in Northern States Grow Timber as Money Crop. (Farmers' Bulletin 1680). 5 cents.
The Farm Woods, a Savings Bank (Leaflet 29). 5 cents.
Measuring and Marketing Farm Timber (Farmers' Bulletin 1210). 5 cents.
Sawfly Injurious to Young Pines (Farmers' Bulletin 1259). 5 cents.
Use of Logs and Poles in Farm Construction (Farmers' Bulletin 1660). 5 cents.
Protection of Log Cabins, Rustic Work, and Unseasoned Wood From Injurious Insects (Farmers' Bulletin 1582). 5 cents.
Forest Farming (Farmers' Bulletin 1794). 5 cents.
How to Cut Southern Farm Timber for Steady Profit (Leaflet 153). 5 cents.

[5] Refer to Farmers' Bulletin 1628, Growing Black Locust Trees. (Price 5 cents.)
[6] See Leaflet 84, Planting Black Walnut. (Price 5 cents.)
[7] Much practical information on what to plant and how to plant forest trees is found in Farmers' Bulletin 1123, Growing and Planting Hardwood Seedlings on the Farm (price 5 cents), and Farmers' Bulletin 1453, Growing and Planting Coniferous Trees on the Farm (price 5 cents).

Production of Maple Sirup and Sugar (Farmers' Bulletin 1366). 5 cents.
Pulpwood Crops in the Northeast (Leaflet 57). 5 cents.
More Turpentine, Less Scar, Better Pine (Leaflet 83). 5 cents.
Small Trees Wasteful to Cut for Saw Timber (Leaflet 55). 5 cents.
Planting Black Walnut (Leaflet 84). 5 cents.
Black Walnut for Timber and Nuts (Farmers' Bulletin 1392). 5 cents.
Growing Black Locust Trees (Farmers' Bulletin 1628). 5 cents.
Growing and Planting Coniferous Trees on the Farm (Farmers' Bulletin 1453). 5 cents.
Growing and Planting Hardwood Seedlings on the Farm (Farmers' Bulletin 1123). 5 cents.
Christmas Trees as a Cash Crop for the Farm (Farmers' Bulletin 1664). 5 cents.

FIGURE 13.—Forest trees needed to check soil erosion and make land bring an income.

The Windbreak as a Farm Asset (Farmers' Bulletin 1405). 5 cents.
Shortleaf Pine (Farmers' Bulletin 1671). 5 cents.
Loblolly Pine Primer (Farmers' Bulletin 1517). 5 cents.
Slash Pine (Farmers' Bulletin 1256). 5 cents.
Longleaf Pine Primer (Farmers' Bulletin 1486). 5 cents.
Southern Pine Beetle Serious Enemy of Pines in the South (Farmers' Bulletin 1586). 5 cents.
Chestnut Blight (Farmers' Bulletin 1641). 5 cents.
Nut Tree Propagation (Farmers' Bulletin 1501). 5 cents.
Basket Willow Culture (Farmers' Bulletin 622). 5 cents.
Trees for Roadside Planting (Farmers' Bulletin 1482). 5 cents.
Trees for Town and City Streets (Farmers' Bulletin 1208). 5 cents.
Propagation of Trees and Shrubs (Farmers' Bulletin 1567). 5 cents.
Transplanting Trees and Shrubs (Farmers' Bulletin 1591). 5 cents.
Pine Tree Treasures (Miscellaneous Publication 106). 5 cents.
Protect White Pine from Blister Rust (Miscellaneous Publication 22). 5 cents.
Currants and Gooseberries, Their Culture and Relation to Blister Rust (Farmers' Bulletin 1398). 5 cents.

FILM STRIPS ON FORESTRY

Film strips on many forestry subjects have been prepared by the Forest Service and Extension Service. Information on how to purchase them may be obtained from the Extension Service, United States Department of Agriculture, Washington, D. C. Following are titles of available film strips (35 mm in width):

Series 199 Chestnut Blight.
216 Forest Planting in the Northeastern States.
219 Keeping Livestock out of the Woods in the North Central States.
319 National-Forest Playgrounds.
327 The Work of the Forest Service.
341 Stop Gullies—Save Your Farm.
349 Forest Conservation.
365 The Mountain Pine Beetle.
367 Forest Fires—How They Are Caused, Their Effects, and Their Detection and Suppression.
369 The Dutch Elm Disease in the United States and Methods of Eradication.
370 Saving Our White Pines From the Blister Rust.
387 Farm Shelterbelts in the Plains Regions.
388 4-H Forestry in the United States.
393 Farm-Forestry Extension in the United States.
447 Farm Forestry in the South.
460 Harvesting Southern Farm Timber for Steady Profit.
506 Forestry and Human Welfare.
507 Famous Trees in the United States.
508 Tree Planting on the Prairie Plains by the Prairie States Forestry Project.
570 Farm Woods—A Safe Crop for Steep Land.

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